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The purpose of this study was to evaluate the effectiveness of the strength and conditioning component of the United States Army John F. Kennedy Special Warfare Center and School (USAJFKSWCS) Human Performance Program on its effectiveness in improving the movement quality and physical performance of Special Forces Candidates (n=511) during Phase V of the Special Forces Qualification Course (SFQC). In addition, this study aimed to determine the association between movement quality and scores on various performance metrics on the reported incidence of injury up to three months after completion of Phase V of the SFQC.

Soldiers underwent a screening process to help identify and mitigate potential injuries, followed by a series of performance metrics aimed at assessing body composition, power, agility, strength, and anaerobic endurance. Soldiers then participated in a comprehensive 19-week strength and conditioning program developed and implemented by certified strength and conditioning specialists. Soldiers were reassessed after the 19-week program to determine if the protocols were successful in improving physical performance.

Based on the data analyses it appeared that the strength and conditioning protocols implemented as part of Phase V of the SFQC were successful in improving physical performance. A series of paired t-tests used to analyze pre-and posttest scores

demonstrated statistically significant improvements in movement quality, body composition, power, agility, and strength.

A binary logistic regression was used to determine odds that performance on the physical performance metrics may be associated with reported incidence of injury. This analysis yielded statistically significant results for the Functional Movement Screen as a predictor for the odds of reporting an injury during Phase V of the Special Forces Qualification Course. Other factors outside the scope of this study, such as age, height, bodyweight, and time in service, may influence the odds of reporting an injury, thus warranting further investigation.

Operational readiness is based on physical abilities and the absence of injury. The results of this study suggest that appropriate strength and conditioning programs can improve certain aspects of operational readiness and possibly mitigate the risk of injury. However, further research should be undertaken to clarify important factors in this regard.

AN EVALUATION OF THE UNITED STATES ARMY JOHN F. KENNEDY SPECIAL WARFARE CENTER AND SCHOOL (USAJFKSWCS) HUMAN PERFORMANCE PROGRAM

by

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Approved by

Committee Chair

To those who serve.

APPROVAL PAGE

This dissertation written by STEPHEN MICHAEL MANNINO has been approved by the following committee of the Faculty of The Graduate School at The University of North Carolina at Greensboro.

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CHAPTER I

PROJECT OVERVIEW

Musculoskeletal injuries have shown to be a major problem among military populations, affecting both combat readiness and combat performance. Nindl, Williams, & Deuster (2013) examined effects of musculoskeletal and non-battle injuries had on military operations from both a financial and soldier readiness standpoint. Their findings showed that in 2012 the leading cause of injury to a soldier was musculoskeletal in nature, resulting in almost 2,200,000 medical encounters. The main causes of these injuries are from physical training and sports. The physical training protocols that lead to these injuries were conducted either by the unit, or the soldiers themselves following commercial physical training programs. In order to mitigate this large number of preventable musculoskeletal injuries, while at the same time improving combat performance the authors recommend the implementation of a human performance program, staffed by professionals who design and implement physical training and rehabilitation protocols (Nindl, Williams, & Deuster, 2013). Although the idea of incorporating human performance professionals into a military setting is relatively new, others have also found that this would be beneficial to improving performance and reducing injury risk. Deuster & O’Connor (2015**)** noted that the human is the most valuable resource and the operational demand of multiple deployments places a huge physical strain on the nation's soldiers. Therefore, a holistic approach to caring for these soldiers should include proper training and rehabilitation protocols.

Background and Rationale

In 2010, during his testimony to Congress, the USSOCOM Commander Admiral William McCraven stated that one of his top priorities was the health and welfare of the force ("Q&A with Admiral William H. McCraven," 2012). This statement led to the development of what is known as the Preservation of the Force and Families (POTFF) initiative; a program designed to help the Special Operations Forces soldier increase their operational longevity, enhance their combat effectiveness, and improve operational readiness, as well as creating a network which will support the families of those soldiers. This was done by instituting three pillars which comprise the POTFF initiative, behavioral, spiritual, and physical, the latter being the focus of this project. The physical pillar focuses on the physical performance of the Special Operations Forces soldier, and is more commonly known as the Human Performance Program. The Human Performance Program is comprised of subject matter experts in the fields of strength and conditioning, physical rehabilitation, nutrition, and cognitive enhancement. The purpose of the Human Performance Program is to develop the physical and cognitive abilities of the Special Operator, thereby mitigating the risk of injury. If an injury does occur, physical therapists and other rehabilitation specialist provide treatment to rehabilitate the soldier to return them to duty quickly and efficiently.

While Admiral McCraven may have made the physical resiliency of the Special Operator his priority he did not develop this concept. Among the first to identify the need for human performance programs within the military were Deuster et al. (2007), who examined the outcomes of the Uniformed Services University of Health Sciences conference, held in June 2006 with the goal of developing a strategic plan for developing human performance programs throughout the Department of Defense. One of the results of the conference determined that a human performance program should enhance mental and physical resilience, accelerate recovery, reduce the risk of injury, provide training and education that transfers to the battlefield, and improve the human weapon systems contribution to mission success (Deuster et al., 2007). Szivak and Kraemer (2015) support this noting that the chronic physical stress encountered by a soldier can lead to decreased mission performance and increased risk of injury. Incorporating a well-structured resistance training program will lead to increased strength, power, and improved body composition. Along with this the resistance training will provide protective effects to the tendons and ligaments, thereby decreasing the risk of injury (Szivak & Kraemer, 2015). It was also established that a delineation be made between fitness for health and fitness for performance. This delineation is important because it is not enough for a soldier to be “fit”, he/she must also be able to translate that fitness to performance on the battlefield. If one merely trains for fitness, they may or may not create a performance effect, however, if one trains with the purpose of improving performance, they will also gain the prerequisite amount of fitness (Deuster & O’Connor, 2015).

In *Building the Soldier Athlete*, Iverson and Anderson (n.d.), outline a Mission Essential Task List (METL) and correlate it to the contribution of physical abilities for each task. Traditional military physical training has long been geared toward developing general fitness. As low-intensity conflicts, conflicts that require special operations forces over traditional forces, become more prominent the human weapon system is now the platform that must be optimized for performance. The Special Operations Forces soldier does not rely on traditional military weapons systems such as tanks and armored vehicles, but rather through an interpersonal relationship with indigenous fighters and teamwork to accomplish the mission (Race & AL, 1989). Iverson and Anderson outline the need for a soldier to perform task-oriented training rather than rely on training protocols designed for general fitness. By training to meet the demands of the job, as opposed to general fitness, mission essential tasks can be performed with greater proficiency and efficiency, while at the same time improving general fitness, and preventing the risk and severity of injury. In other words, training for performance will elicit fitness, but training for fitness will not necessarily improve performance (Iverson & Anderson, n.d.).

As a result of the issues presented above, and the institutionalization of the POTFF initiative, the USAJFKSWCS Human Performance Program was staffed and implemented with the intent of improving and enhancing functional capacity, strength, agility, and flexibility, while decreasing the risk and severity of injury (Burton, Nance, & Walton, 2011). The USAJFKSWCS Human Performance Program and the other Human Performance Programs developed as a result of the POTFF initiative signify a major shift in the way Special Operations Forces optimize soldier performance (Deuster & O'Connor, 2015). This new approach deviates from traditional military physical training and rehabilitation by implementing strength, conditioning, and rehabilitative protocols typically used with traditional athletes to improve performance and decrease the risk of injury. If an injury does occur, then rehabilitation and reconditioning facilitates a rapid return to duty.

Purpose Statement

The intent of this study is to determine the effectiveness of the strength and conditioning aspect of the Human Performance Program at USAJFKSWCS as it relates to improving scores on physical performance metrics and the odds that scores on the performance metrics influenced reported incidence of injury in Special Forces Candidates.

Aims

Aim #1: Screen and assess Special Forces Candidates using four screening tools and five performance metrics to determine the effectiveness of the strength and conditioning aspect of the USAJFKSWCS Human Performance Program.

Aim #2: Determine the association between scores on the physical performance metrics and injuries reported through the Human Performance Program health care providers.

Methods

Special Forces Candidates enrolled in Phase V of the Special Forces Qualification Course participated in a 19-week strength and conditioning program, designed and implemented by Certified Strength and Conditioning Specialists. All 511 participants examined as part of the study were male, as at the time of the study, no female soldiers were authorized to attend Special Forces Assessment and Selection, thus not able to attend the Special Forces Qualification Course.

Before beginning the training program, all candidates were screened using four screening tests. These tests consisted of a Modified Beiring-Sorensen Back Extension Test, Closed-Chain Dorsiflexion Test, Functional Movement Screen, and Army Physical Fitness Test. The purpose of these screening tools was to determine if any physical limitations were present and if those physical limitations would compromise performance or increase the potential for injury with training.

Candidates were then assessed using five physical performance metrics. These metrics were designed to establish a baseline for body composition, power, agility, strength, and anaerobic performance. The metrics used were a 7-site skin fold test for body composition, Standing broad jump to assess power, 5-10-5 Pro agility shuttle run to measure agility, 3RM Trap bar deadlift to assess strength, and 300-yard Shuttle run to assess anaerobic endurance.

Upon completion of screening and performance testing, candidates began a 16-week strength and conditioning program. The total length of time was extended to 19-weeks to account for days when training could not occur due to holidays. The program consisted of a periodized strength training program performed three days per week. Two of the three days were supervised by certified strength and conditioning specialists, with the third day performed without supervision. Candidates were divided into two groups based on their performance on the screening and performance tests and training protocols were modified to address the needs of the individual soldier.

The conditioning protocol was designed to complement the strength training protocol and was 19-weeks in duration. The three-week difference between the strength training and conditioning protocols existed because the conditioning protocol was expected to be done on holidays and days where soldiers were not required to report for duty. The program consisted of a variety of conditioning methods designed to improve the performance of the three energy systems, with the main goal of improving the aerobic (oxidative) energy system. All sessions of the conditioning protocol were unsupervised by the Human Performance Program staff.

Injury data was captured through the reported injuries treated by USAJFKSWCS Human Performance Program Physical Therapists. Injuries were reported during training through three months after completion of the strength and conditioning program. All injury, screening, and performance data were stored in a secure, centralized database managed by the USAJFKSWCS Human Performance Program Data Analyst.

Upon completion of the training program soldiers were re-assessed on the Functional Movement Screen and all five-performance metrics. To determine the effectiveness of the strength and conditioning program, pre-and posttesting results were compared for improvement using a paired samples t-test. The association between scores on the Functional Movement Screen and performance metrics and injury was analyzed using a binary logistic regression. A binary logistic regression estimates the odds of reporting an injury given the score achieved by a soldier on the FMS and each of the performance metrics during the testing process. Pretest scores were compared against injuries reported during training, while post test scores were compared against injuries reported after training.

Findings

The results of the statistical analysis identified a statistically significant improvement in four of the five performance metrics and quality of movement. Functional Movement Screen scores used to assess quality of movement improved from an average score of 14.37 to 15.5 (out of a possible score of 21), $p = <.01$, $d = 0.58$. Body composition showed a statistically significant improvement with the average percent body fat dropping from 12.58 to 11.61, $p = <.01$, $d = 0.25$. There was also a statistically significant improvement in the Standing broad jump, with average scores improving from 91.67 inches to 93.30 inches, $p = <.01$, $d = 0.19$. Agility, as measured by the 5-10-5 Pro agility shuttle run, showed an improvement with the average time to completion of 4.95 seconds to 4.90 seconds, $p = <.01$, $d = 0.18$. In addition, there was a statistically significant improvement in strength as measured by the 3RM Trap bar deadlift, with the average weight lifted increasing from 323.00 pounds to 351.48 pounds, $p = <.01$, $d = 0.51$. A non-significant improvement was shown in 300-yard Shuttle run times, with the average pretest time recorded as 64.66 seconds and posttest times of 64.63 seconds, $p = .80$, $d = 0.01$.

The results of the binary logistic regression did not conclusively support the hypothesis that scores from Functional Movement Screen and performance metrics could help to identify the odds of reporting injuries during the Special Forces Qualification Course. However, other factors such as age, height, weight, and time in service, were identified as statistically significant for determining the odds of reporting injuries during the Qualification Course.

Implications

The implementation of a human performance program requires a basic framework in which the program is administered. This framework should be comprised of industry standards as well as best practices that support the philosophy of performance improvement while, at the same time, mitigating the risk of injury. While there is no standard method of implementing the strength and conditioning component of a human performance program, this study shows that a system that utilizes a screening and assessment process, followed by a systematic, and progressive strength and conditioning protocol, appears to be an effective way to improve performance and may possibly mitigate the risk of injury to Special Forces Candidates.

The impact the strength and conditioning component of the USAJFKSWCS Human Performance Program has on improving the movement quality, body composition, power, agility, and strength, may help to improve the combat performance of the Special Forces soldier. Competency in these physical areas are required to perform the mission specific tasks that each Special Forces soldier faces. Improvements in these basic physical components should help to improve the proficiency and efficiency of the mission specific tasks required of the Special Forces soldier. Moreover, these same physical skills are required of many other tactical professions, to include other members of the military, firefighters, police, and first responders. Thus, the basic tenets of the best practices established by the strength and conditioning component of the USAJFKSWCS

Human Performance Program may be transferable to other tactical populations. Improving the physical fitness levels of tactical athletes through a systematic process of screening for physical limitations, testing for physical performance, and the implementation of a systematic, progressive strength and conditioning protocol should allow tactical athletes to perform their mission specific skills that require quality movement, optimal body composition, power, agility, and strength to be performed at a higher level. Another implication of this study is the mitigation of injury based on the odds ratio established between scores on the Functional Movement Screen, and physical performance metrics on the incidence of injury occurring with Special Forces Candidates.

Establishing the odds that various factors have on the reporting of injuries (overuse and acute), would be beneficial in determining training goals for Special Operations Forces soldiers. These training goals could help to mitigate the incidence of injury, thus, decreasing the amount of time spent out of training, reducing the cost of producing a Special Forces soldier, and producing more Special Forces soldiers allowing USAJFKSWCS to meet the demand of Special Forces soldiers required for operational units.

CHAPTER II

DISSEMINATION

The findings of this project are planned to be presented at the United States Special Operations Command (USSOCOM) Human Performance Leader's Summit, held each February at MacDill Air Force Base in Tampa Florida. This summit is attended by the stakeholders of the USSOCOM Human Performance Program, including military commanders and human performance personnel. Pending the reception of the findings, the information will then be presented to a broader audience of human performance professionals at the National Strength and Conditioning Association Tactical Strength and Conditioning Training Event and submitted for publication to the *Journal of Strength and Conditioning Research.*

In 2012, the leading cause of injury to a soldier was musculoskeletal in nature, resulting in almost 2,200,000 medical encounters (Nindl et al., 2015). Considering the estimated cost to train and educate a US Army Special Forces Officer over a ten-year period is $847,082, not including salary ("How the U.S. Military Followed the Lead of the Sports World," 2014), overuse injuries present a tremendous financial burden on the United States government. Moreover, soldiers forced out of service due to injury deprive the force of experienced operators. For these reasons, there is a critical need to establish a criterion to help mitigate injury risk.

Musculoskeletal injuries have shown to be a major problem among military populations, affecting both combat readiness and combat performance. Nindl et al. (2013) examined musculoskeletal and non-battle injuries and their effects financially and manpower-wise on military operations. The main causes of these injuries were from physical training and sports. The physical training protocols that lead to these injuries were conducted either by the unit, or the soldiers themselves following commercial physical training programs. To mitigate this large number of preventable musculoskeletal injuries, while at the same time improving combat performance, the authors recommend the implementation of a human performance program staffed by professionals who design and implement physical training and rehabilitation protocols (Nindl et al., 2013). As a direct result, several studies (Nabeel, Baker, & McGrail, 2007; Teyhen et al., 2015; Zambraski & Yancosek, 2012) have focused on musculoskeletal injuries within the tactical population and found that those with higher levels of fitness experienced fewer injuries when compared to those with lower fitness levels. Collectively, this body of information suggests that there is likely to be a relationship between musculoskeletal injuries and the type of physical preparation program in which a soldier participates.

The evidence cited above has led the United States Special Operations Command to launch human performance programs for each of the components under its purview. The most recent findings in this area support and extend this concept by identifying the fact that musculoskeletal injuries are prevalent among military populations, yet the risk of injury can be mitigated through a strength and conditioning plan developed and administered by qualified strength and conditioning specialists (Stephenson, 2009). Several other studies have contributed to the contemporary body of knowledge by showing that improved physical abilities can decrease the risk of overuse injuries by improving resilience to stress and impacting mission readiness (Szivak & Kraemer, 2015). In addition, they have extended the observations made by Nindl et al. (2013) who earlier used a different strategy to evaluate the effects physical preparation has on overuse injuries, examining the causes for seeking treatment for overuse injury and found that a comprehensive human performance program operated by subject matter experts could mitigate these injuries. It can be reasonably concluded from these studies that proper physical preparation should help mitigate the occurrence of overuse injuries in Special Operations Forces soldiers.

Statement of the Problem

Although the work cited above strongly suggests that physical preparation may impact the incidence and nature of musculoskeletal injuries among tactical athletes, the precise relationships that exist to explain this are currently unknown. Although there have been some studies analyzing human performance programs, there is no consensus as to what constitutes best practices of program implementation (Deuster et al., 2007). In addition, the physical abilities required of the Special Operations Forces soldier are highly debated. While there is agreement about the basic physical abilities required of the Special Operations Forces soldier, due to the varying nature of mission requirements, there is no definitive standard as to what level these physical abilities should be developed. Due to this discrepancy, the methods used to evaluate the physical performance characteristics of the soldier cannot be agreed upon by the subject matter experts (Nindl et al., 2015).

Purpose and Hypothesis

Due to the issues presented above, an interdisciplinary human performance program was developed by the United States Army Special Operations Command (USASOC) to help mitigate these issues, and falls under a larger initiative known as the United States Special Operations Command (USSOCOM) Preservation of the Force and Families (POTFF) program. The program is separated into two parts, the first relates to human performance, the second deals with behavioral health issues, and is beyond the scope of this project.

Aim one of this study was to screen and assess Special Forces Candidates using four screening tests and five physical performance metrics to determine the effectiveness of the strength and conditioning program. A comparison between pre- and posttest scores on the performance metrics and the Functional Movement Screen were completed to determine program effectiveness

Aim two was to determine the association between scores on the Functional Movement Screen and the physical performance metrics on reported injuries of Special Forces Candidates. Scores on the Functional Movement Screen and physical performance metrics, as well as injuries reported to USAJFKSWCS Human Performance Program healthcare providers were used to calculate the odds ratios. Reported overuse and acute injuries were recorded in the USAJFKSWCS Human Performance Program database.

Methods

Description of Participants

Subjects were 511 Special Forces Candidates during Phase V of the Special Forces Qualification Course. Candidates participated in the Human Performance program as part of their program of instruction. At the time of this project, females were not eligible to participate in Special Forces training, thus, all subjects were male, between 20 and 44 years of age. A more detailed description of participant demographics can be found in Appendix F.

Procedure

Prior to beginning the training program, all participants underwent a physical screening process to help identify physical limitations to mitigate injuries that could arise as part of the training process. Upon completion of the screening protocol participants underwent a physical performance testing battery to assess body composition, power, agility, strength, and anaerobic endurance. Screening protocols and physical performance metrics were collected over the period of one week.

Once the screening and performance protocols were completed, soldiers participated in a strength and conditioning program designed by the USAJFKSWCS human performance staff. The strength and conditioning program was 19 weeks in duration, at which point participants underwent a post testing process.

Screening Tests

The screening methods used were a modified Beiring-Sorenson Back Extension Test, Closed-Chain Dorsiflexion (CCDF) Test, Functional Movement Screen (FMS), and

Army Physical Fitness Test (APFT). The last officially recorded APFT was used and was not administered by the human performance staff, as the staff is not authorized to administer an official APFT. Details on how these screening protocols were implemented can be found in Appendix A.

Performance Metrics

Five (5) metrics were used to assess physical performance. These metrics have been identified by the USSOCOM Human Performance staff and are the official measures by which physical performance is assessed for the POTFF Human Performance Program. The metrics used were body composition, Standing broad jump, 5-10-5 Pro agility shuttle run, 3RM Trap bar deadlift, and 300-yard Shuttle run. Details of the implementation of these physical performance protocols can be found in Appendix B.

Strength and Conditioning Protocols

The purpose of the strength training protocols was to increase the amount of strength and power developed by the soldiers. This was done through a variety of resistance training methods utilizing, bands, barbells, dumbbells, kettlebells, and plyometric exercises. The conditioning protocols were designed to improve the capacity and functioning of the body's three energy systems, Adenosine Triphosphate – Phosphocreatine (ATP-PC), glycolytic, and oxidative (aerobic) energy systems. To accomplish this a variety of methods were used including long slow distance running and ruck marches, interval sprints, and maximum effort sprints.

As part of the warm-up, both the strength training and conditioning protocols included corrective exercises designed to improve mobility and overall movement quality.

Strength training protocols.

The strength and conditioning program was divided into four (4), totaling 16 weeks of training (19 total weeks to account for missed training days). Each phase was four (4) weeks in length, consisted of three training sessions per week, two sessions supervised by the strength and conditioning staff, and one performed without supervision. The program followed a periodized approach and was total body in nature. The program was designed to begin with an accumulation phase characterized by high volume and low intensity and progressed to more intensive training characterized by low volume and higher intensity. Training sessions consisted of compound exercises that trained the ten (10) movement categories over the course of each training week (explosive/total body, double and single-leg knee dominant, vertical and horizontal pushing, vertical and horizontal pulling, straight and bent leg hip dominant, and core/trunk exercises). Exercises were modified based on individual abilities and limitations. In addition, mobility exercises were prescribed based on the results of the Functional Movement Screen and closed-chain dorsiflexion test. Soldiers were placed in one of two lifting groups, the “red” group or the “green” group. Groups were determined by the results of the screen and performance metrics. Soldiers demonstrating movement and performance proficiency were placed in the “green” group, those not demonstrating proficiency were placed in the “red” group. During week 12 (Training Block D), soldiers were reclassified for the last phase of training to either be in the “advanced” or “basic” group. Again, soldiers demonstrating proficiency during training were placed in the “advanced” group, others were placed in the “basic” group. The “advanced” group performed more complex movements, while the “basic” group performed fundamental exercises. See Appendix D for a detailed description of the strength and conditioning protocol.

Conditioning protocols.

The conditioning portion of the training plan was performed in conjunction with strength training and consisted of five (5) phases. Phases one and four consisted of three training sessions per week, while phases two, three, and five consisted of four training sessions per week. The conditioning program was 19 weeks in length. The discrepancy between the number of weeks in the strength training program is because the conditioning plan was expected to be done on holidays and days off from duty. The program consisted of tempo runs, interval runs, distance runs, and sprints and was designed to improve all three energy systems, with the focus being on aerobic improvement. A detailed description of the conditioning protocol can be found in Appendix E.

Injury Review

Injuries were tracked using an internal Human Performance Database managed by a data analyst. This database is separate from the US Army medical database and only tracks treatments provided by healthcare professionals working within the US Army Special Operations Command Human Performance Program where physical therapists and athletic trainers enter treatment and injury information of soldiers. Injuries are categorized as either acute or overuse.

Data Analysis

Upon completion of the training program and post testing procedures, a paired samples t-test was used to determine the effectiveness of the training protocols. In addition, a binary logistic regression was used to determine odds ratio between scores on the performance metrics and reported injuries.

Results

Strength and conditioning program effectiveness.

To determine the effectiveness on the strength and conditioning program on improving physical performance, IBM SPSS 25 was used to conduct a paired samples t-test to compare pre-and posttest results for the Functional Movement Screen (FMS) and each of the performance metrics. Information concerning the analysis of program effectiveness on improving physical performance can be found in Appendix F.

Significant improvements between pre- and posttest scores were found for:

- Movement Quality
- Body Composition
- Power
- Agility
- Strength

These results show that the participants improved their physical performance over the course of participating in the program. However, because a comparison control group was not used, the improvements cannot be directly attributed to the strength and conditioning protocols implemented as part of the USAJFKSWCS Human Performance Program.

Comparing pretest and posttest scores for the Functional Movement Screen and the five performance metrics yielded the following results; Functional Movement Screen, (M = 14.37, SD = 2.12), (M = 15.52, SD = 1.81); t(445) = -12.84, p = <0.01, d = 0.58 Body fat percentage (M = 12.59, SD = 3.91), (M = 11.61, SD = 3.97); t(405) = 8.37, p = <0.01, d = 0.25, Standing broad jump scores (M = 91.68, SD = 8.25), (M = 93.30, SD = 8.54); t(402) = -6.3, p = <0.01, d= 0.19, 5-10-5 Pro agility shuttle run times (M = 4.95, SD = .30), (M = 4.90, SD = .29); t(402)= 4.27, p = <0.01, d = 0.18, and 3RM Trap bar deadlift scores (M = 323.00, SD = 54.16), (M = 351.48, SD = 58.20); t(286) = -11.36, p = <0.01, d = 0.51. All showed statistically significant improvement, although the effect sizes for the Standing broad jump and Pro agility shuttle were small. These results showed the strength and conditioning protocols prescribed through the Human Performance Program were associated with improved the movement quality, body composition, power, agility, and strength of Special Forces Candidates. However, additional studies using a control group are needed to determine if the training protocols are casual regarding the improvement in movement quality and performance in Special Forces Candidates

Odds of performance metric scores influencing reported incidence of injury.

A binary logistic regression using IBM SPSS 25 was used to determine the odds of the Functional Movement Screen and various performance metrics on the reported incidence of injury. This analysis used pretest data to determine the odds of all injuries (both overuse and acute) reported during the strength and conditioning training program, and used posttest data to determine the odds of all injuries reported within three months of completion of the strength and conditioning program. Details of the analysis are available in Appendix F.

Although the pretest Functional Movement Screen score was the only hypothesized factor that produced statistically significant results in estimating the odds of reporting an injury, an estimated decrease of 15% in reporting all injuries during training, ($p = 0.05$, 95% CI 0% to 73% decrease), some promising trends emerged. The influence of increased Functional Movement Screen scores and increased body fat percentage estimated a decrease in the odds of reporting of injuries. Increased (slower) times on the 5-10-5 Pro agility shuttle run and 300-yard Shuttle run also produced an estimated decrease in the odds of reporting an injury. Meanwhile, an increase in the amount of weight used in the 3RM Trap bar deadlift estimated an increase in the odds of reporting an injury.

This information is in a positive direction which may suggest that improved movement quality may mitigate injury risk in Special Forces Candidates. However, while seemingly contradictory, an increase in body fat percentage and slower run times may also contribute to injury mitigation. However, an increase in strength may have a negative influence on injury mitigation

Supplemental Results

Only one of the factors focused upon as part of this planned study was found to be statistically significant, age was shown to be associated with the odds of reporting an overuse injury during training. The reporting of overuse injuries was estimated to increase by 18% with each additional year of age, after controlling for all other factors in the model. This increase was statistically significant ($p = 0.01$, 95% CI 1.6% to 38% increase).

Another factor not part of the planned study also yielded statistically significant results. The odds of reporting an acute injury during training were influenced by height, increasing the reporting by an estimated 39% with each unit increase, after controlling for all other factors in the model. This increase was statistically significant ($p = <0.05$, 95% CI 7.7% to 78.2% increase). Also, each increase in pound of bodyweight (similar to percent body fat) was estimated to slightly decrease the odds (by 4%) of reporting an acute injury ($p = 0.05$, 95% CI 0% to 8% decrease).

In addition, it was found that the pretest results were associated with the odds of all reported any injuries during training. Like the above, it was estimated that the reporting of injuries would increase by 27.1% with each unit increase in height, after controlling for all other factors in the model. This increase was statistically significant ($p = <0.05$, 95% CI 5.0% to 53.9% increase). Also, the odds of all reported injuries were estimated to increase by 12.7% for each unit increase of time in service, after controlling for all factors in the model. This result was also statistically significant ($p = 0.05$, 95% CI 0% to 26.7%).

Concerning the posttest results, they also influenced the odds of reporting an acute injury post training by an estimated 32% with each unit increase in time in service, after controlling for all other factors in the model. This increase was statistically significant (p = <0.05, 95% CI 2% to 71.1% increase).

Discussion

There were two aims of the project, the first was to determine the effectiveness of the strength and conditioning program designed and implemented by the USAJFKSWCS Human Performance Program staff. The second, was to determine odds ratios between scores on the physical performance metrics and reported acute and overuse injuries during training and after training. The main findings were that the strength and condition program produced statistically significant improvements in movement quality, body composition, power, agility, strength, and anaerobic endurance. However, the effect sizes for Standing broad jump and Pro agility shuttle were small.

While the findings related to the planned study showed limited statistically significant evidence between the Functional Movement Screen and performance metrics and the odds of reporting an injury, they do suggest that other factors not part of the planned study bodyweight, height, age, and time in service may influence the odds of reporting an injury. Nevertheless, it should be noted that some of the performance metrics as related to the odds of being injured which were under study showed a positive trajectory and should be studied further.

Aim #1: Strength and Conditioning Program Effectiveness

There have been no studies investigating the effectiveness of the strength and conditioning program implemented by the USAJFKSWCS Human Performance Program staff. The findings of this study, which were analyzed using a paired samples t-test, highlighted that a systematic, progressive, scientifically-based strength and conditioning protocol, implemented and supervised by qualified strength and conditioning professionals produces measurable and statistically significant improvements in physical performance.

One of the main problems with strength and conditioning programs is that while improvements are often seen, it is not known if those improvements are a result of these programs. Though some improvements, as seen through the mean pretest and posttest scores, were minimal, this could be explained through an understanding of the tests themselves. For example, the 5-10-5 Pro agility shuttle run is a relatively short test, with the slowest time in all trials being less than 6 seconds, and the fastest time being just over 4 seconds. For this reason, there was not expected to be a large improvement between pretest and posttest. This same logic could be applied to the Functional Movement Screen, where the maximum score is a 21, limiting the amount of improvement that can be made. In addition, large improvements in the Standing broad jump were not expected because the aerobic focus of the strength and conditioning program compromised the power development of the soldier. Moreover, the changes in body composition were not expected to be great, as the length of time required for dramatic changes in body composition was longer than the length of time over which the strength and conditioning program was administered. The t-test used to analyze the data for this project showed that the improvements in performance were likely not by chance, and could probably be directly attributed to the program.

There are some limitations to this study that should also be acknowledged. Though the participants have a detailed training background, the experience with the metrics used in the testing protocols varied greatly. Some participants were collegiate athletes with a high training age and exposure to the activities used in the protocols. Others had little exposure to the activities prior to beginning the program. For this reason, the training effect for those with less experience may have yielded results higher than normally expected. Another limitation was the lack of control of the daily schedule. On occasion, training sessions were cancelled due to other obligations such as urinalysis, briefing attendance, or being assigned to work details. Also, because most of the conditioning sessions were asked to be done unsupervised, the possibility of them being conducted improperly, or not at all, exists. This may explain why the improvements in performance in the 300-yard Shuttle run were not statistically significant and not as great as with the activities related to strength and power.

Aim #2: Determine the Association Between Scores on the Functional Movement Screen and Physical Performance Metrics on Injuries Reported Through the Human Performance Program Health Care Providers

Although it was hypothesized that performance on the Functional Movement Screen and performance metrics would influence the odds of reporting an injury (either overuse or acute), the results of the binary logistic regression suggested otherwise. However, other factors not controlled for this study, such as bodyweight, age, height, and time in service, may be important in determining the likelihood of reporting an injury during Phase V of the Special Forces Qualification Course.

One limitation of the study was that due to the nature of the Special Forces Qualification Course, many soldiers are hesitant to come forward with an injury for fear it will delay their graduation form the Qualification Course, or worse be dropped from training completely. Hence, this study may not be representative of the injuries that occur during Phase V of the Special Forces Qualification Course.

Another limitation was that the injury data was mined through the internal Human Performance Program database, and not the official US Army medical database. A soldier were seeking medical care outside of the Human Performance Program would not have that injury documented within the internal database, thus those injuries would not be included in this study. As a result, a more in-depth investigation may be required to determine if the performance metrics, Functional Movement Screen, and/or other factors can be used to determine the odds of reporting an injury during Phase V of the Special Forces Qualification Course.

Though not significant, some of the results returned from the binary logistic regression may warrant further investigation. Increases in Functional Movement Screen scores, bodyweight, and body fat percentage were consistently estimated to decrease the odds of reporting an injury. This implies that movement quality, and while counterintuitive, a higher percentage of body fat, may play a role in mitigating injury risk. An explanation for these results could be that soldiers who can move with less compensation are less likely to place themselves in biomechanical disadvantageous positions, thus are less likely to incur an injury. The increased bodyweight of soldiers could have had a potentially protective effect on the incidence of injury. Increased bodyweight may have allowed the soldier to better absorb the impact on the body during ruck marching, airborne operations, and other inherently military related tasks. In addition, a higher percentage of body fat may have occurred because of less intense training effort. Extreme high intensity exercise has been linked to a decrease in percent body fat as well as increased incidence of injury (Hak, Hodzovic, & Hickey, 2013). Since the intensity level of a training program is driven by the level of effort put forth, it can be possible that the increase in body fat percentage and as a result the decreased odds of reporting an injury, can be linked to a lower level of effort put forth by the soldier. This reasoning can also be applied to the trend of increased 5-10-5 Pro Agility Shuttle and 300-yard Shuttle run times decreasing the odds of reporting an injury. Conversely, there was a trend indicating that an increase in 3RM Trap bar deadlift weight increased the likelihood of reporting an injury. This can be attributed to the possibility of lifting mechanics were compromised by attempting to lift more weight than appropriate for the individual. Although the soldiers taking part in the training program are supervised and instructed on proper lifting technique, this may indicate a need for more individualized goals to ensure soldiers are keeping within their physical limitations. In addition, the length of time in service also indicated a trend in increasing the likelihood of reporting an injury. One explanation for this is that the demands of military related tasks such as ruck marching, airborne, and combat operations, take a physical toll on the body. A soldier with longer time in service has been subjected to these demands for a longer period of time, and this physical toll has manifested itself during the Special Forces Qualification Course.

CHAPTER III

ACTION PLAN

The impact of this research is currently of interest within military circles. The *Joint Special Operations University (JSOU) Special Operations Research Topics 2017* represents a list of Special Operations Forces (SOF)-related topics recommended for research by those who desire to provide insight and recommendations on issues and challenges facing the SOF enterprise. One of the priority topics identified is the Preservation of the Force and Family, specifically implications and effects of adopting programs to optimize SOF human performance, which is directly related to this project ("JSOU Research Topics," n.d.). This interest comes at a time when operational readiness is paramount, particularly with current and future wars expected to low intensity conflicts, military conflicts between two or more state or non-state groups which is below the intensity of conventional war, requiring special operations troops. This is a major concern for military commanders as estimates place current US Army operational readiness at 85% (Nindl et al., 2013). Based on this information, a Special Forces Operational Detachment – Alpha (SFODA), the primary tool of Army Special Operations comprised of 12 men, would have 2 of its team members on non-deployable status, increasing the emotional and physical strain on the remaining team members, and potentially having a negative impact on mission effectiveness.

Short Term Goals

While the topic of this project has an impact on the entire tactical community (military, law enforcement, fireman, first responders), the sub-community of special operations is a much more targeted audience for whom the findings of this project need to be reported. For this reason, the ideal arena to disseminate the initial findings of this project is the United States Special Operations Command (USSOCOM) Preservation of the Force and Family (POTFF) Human Performance (HP) Leader's Summit.

Held during the first week of February each year at the home of USSOCOM at MacDill Air Force Base in Tampa, FL, representatives of the human performance programs from each of the component special operation commands (Army, Navy, Air Force, Marines) gather to review initiatives from the previous year, discuss best practices, and plan the way ahead for the upcoming year.

During the 2018 HP Leader's Summit, research and program evaluation were topics heavily discussed. Staff from the USSOCOM Departments of Acquisitions, Technology, and Logistics (AT&L) and Science and Technology (S&T) spoke to those in attendance about the importance of research and program evaluation for the future of the POTFF HP Program. This project will help to contribute to the growing amount of research being conducted throughout the special operations community.

The impact of this project brings awareness of how, and to what extent, movement quality and performance levels influence injury rates of Special Operations Forces soldiers. Presenting the findings of this project to the subject matter experts (SME's) at the POTFF HP Leader's Summit is the first step in having other human performance programs in the special operations community examine the relationship between movement, performance, and injury.

Intermediate Goals

The feedback provided upon presentation of the project to this select group of subject matter experts at the USSOCOM POTFF HP Leader's Summit will likely lead to the intermediate goal of this project being presented to a larger audience in the future in the form of a presentation at the National Strength and Conditioning Association (NSCA) Tactical Strength and Conditioning (TSAC) Training Event held during April of each year. In addition, the information gained through this project matches a NSCA area of interest and thus is well suited to be published in the *Journal of Strength and Conditioning Research*. Due to this exposure, similar projects can be originated at other tactical units, tailoring the project to the meet the specific needs of each individual unit.

Long Term Goals

The cost of the POTFF Human Performance program was approximately $200 million per year from 2013-2018**.** The POTFF program and cost of it is expected to grow approaching $500 million per year as the contract is scheduled for re-bidding in March of 2018. As such, this project provides relevant information to validate the value of the Human Performance Program not only for the special operations community, but the tactical community at large. Moreover, it will help to stimulate research and influence the future of the POTFF Human Performance Program by demonstrating evaluate ways to ensure a positive return on investment (ROI) that can be reported to Congress, in turn, helping to justify the POTFF Human Performance Program's existence and allow for increased funding and resources.

End State

While optimizing the performance of Special Operations Forces soldiers, and solidifying the existence of the POTFF Human Performance Program would be worthy achievements, the ultimate goal of this project is to stimulate change in the physical training culture of the entire United States Military. By transitioning away from traditional military physical training consisting of excessive long distance running, ruck marching, and non-progressive callisthenic exercises, and adopting a comprehensive human performance program that uses scientifically based protocols implemented by subject matter experts, the Department of Defense could potentially save millions, if not billions, of dollars in lost training time, disability claims, and soldiers physically unfit for duty.

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APPENDIX A

METRICS RECORDING SHEET

Last Name: ______________________

First Name: ______________________

Pre-Test Date: ___________________

Mid-Test Date: ___________________

Post-Test Date: ___________________

DEMOGRAPHICS

Last 4		DoD ID#			
Date of Birth		Height (Inches)		MID	POST
Gender		Weight (Pounds)			

SERVICE HISTORY

Service Start Date		Rank		
SOF Service Start Date		Unit		
Current MOS		Sub-Unit 1		
Future MOS (if applicable)		Sub Unit 2		

DAYS SINCE LAST DEPLOYMENT

0-90	91-120	121-270	271-365	>365	NEVER

PARTICIPATION

1x/yr	2x/yr	4x/yr	6x/yr	1x/mo	2x/mo	1x/wk	>1x/wk

PERFORMANCE METRICS

	PRE	MID	POST
5-10-5 Pro Agility(Right—seconds)			
5-10-5 Pro Agility (Left—seconds)			
Broad Jump (inches)			
3RM Trap Bar Deadlift (pounds)			
300 Yard Shuttle Run I (seconds)			
300 Yard Shuttle Run II (seconds)			

BODY COMPOSITION

	PRE-TEST	POST-TEST
TRICEPS		
SUB-SCAPULA		
MID-AXILLARY		
CHEST		
ABDOMINAL		
ILLIAC CREST		
THIGH		
SUM OF SKINFOLDS		
BODY FAT %		

Last Name: ____________________ **Pre-Test Date:** __________________

First Name: ____________________ **Post-Test Date:** __________________

GENERAL SCREEN
Back Extension Test >90 Seconds Y N
APFT SCORE ________ Push-ups >50 pts. Y N Sit-ups >50 pts. Y N 2-Mile Run >50 pts. Y N
Closed Chain Dorsiflexion >10 cm Left: Y N Right: Y N

Y-BALANCE TEST

Upper Quarter: Right LE Limb Length _______cm

Lower Quarter: Right LE Limb Length _______cm

LQYBT	Greatest Right	Greatest Left	Difference
Anterior			
Posteromedial			
Posterolateral			

Composite Right Score:

Upper: ____________

Lower: ____________

UQYBT	Greatest Right	Greatest Left	Difference
Medial			
Inferolateral			
Superolateral			

Composite Left Score:

Upper: ____________

Lower: ____________

FUNCTIONAL MOVEMENT SCREEN

Hand Dominance L R Leg Dominance L R

Tibial Tuberosity Length ____________ Hand Size ____________

Movement		RAW SCORE I	FINAL SCORE I	RAW SCORE II	FINAL SCORE II
Deep Squat					
Hurdle Step	L				
	R				
In-Line Lunge	L				
	R				
Shoulder Mobility	L				
	R				
Impingement Clearing Test	L				
	R				
Active Straight Leg Raise	L				
	R				
Trunk Stability Push-up					
Press-up Clearing Test					
Rotary Stability	L				
	R				
Posterior Rocking Clearing Test					
FINAL SCORE					

APPENDIX B

PHYSICAL SCREENING PROTOCOLS

Modified Biering-Sorenson Back Extension Test

The test was administered with the soldier lying on a bench in the prone position. The soldier then has his feet secured and on the command of “go” the soldier positioned their body parallel to the ground with the arms crossed in front of the chest. To pass the test, the soldier must remain parallel to the ground for 90 seconds. This is a pass/fail test to determine if the soldier possess adequate core stability.

Closed-Chain Dorsiflexion (CCDF) Test

Soldiers placed their big toe on the 10cm mark of a measuring tape perpendicular to a wall. The soldier then assumed the half-kneeling position and attempted to dorsiflex the ankle until the knee touches the wall. The heel must remain in contact with the ground to be considered a successful attempt. This process is repeated on the opposite side. Dorsiflexion is a pass/fail test to determine if the soldier possess adequate ankle mobility.

Functional Movement Screen (FMS)

Movements performed perfectly with no compensation, minor compensation, and major compensation, are awarded scores of 3, 2, and 1, respectively. A score of 0 is awarded if pain is experienced during the movement. Those scoring 0 are referred to a medical professional for evaluation. Soldiers scoring a 0 or 1 on any of the seven tests will use modified strength and conditioning protocols. Modified programs are designed to fit the needs of the individual, allowing them to continue to train and make performance improvements.

Army Physical Fitness Test (APFT)

The APFT is comprised of 3 events, maximum push-ups in two minutes, maximum sit-ups in 2 minutes, and a 2-mile run. If a soldier fails to achieve 60 points out of 100 for each event, they are below the minimum physical standard to participate in the performance metrics.

APPENDIX C

PERFORMANCE METRIC PROTOCOLS

Body Composition

Body composition was measured using 7-site skinfold using American College of Sports Medicine Standards and a Lange Skinfold Caliper. Measurements were recorded to the half millimeter and then converted to a percentage using the Jackson-Pollack equation.

Standing Broad Jump

The Standing broad jump was performed with the subject in the standing position and their toes behind the line marked at zero inches. The subject jumped forward, and upon landing, the subject must hold the landing position with no assistance. Distance was measured to the nearest half-inch from the heel of the foot closest to the starting point. Each subject received three attempts with the highest score being recorded.

5-10-5 Pro Agility Shuttle Run

The subject assumed the starting position, straddling the starting line, ran 5-yards to the left, changed direction and ran 10-yards to the right, and again changed direction and ran 5-yards to the left through the start/finish line. The subject was given a 1-minute rest and repeated starting to the right. Each soldier received one attempt starting in each direction. Times were recorded to the nearest 1/100th of a second using a Brower speed trap automated timing system with the average of the attempts being recorded.

Trap Bar Deadlift (3RM)

The deadlift exercise is one where a weight is lifted from the ground to a position where the knees and hips are fully extended in the standing position. The soldier gradually increased the weight lifted during each set until they reached the most weight they could lift for three repetitions with good technique. Weight was recorded to the nearest 5 pounds.

300-yard Shuttle run

On the command of go, the subject sprinted 25-yards, and returned to the start line. They repeated this process six times, completing 300 total yards. Times were recorded to the nearest second. The soldier performed two trials with a 2-minute rest between trials. Times were recorded via stopwatch to the nearest second. The average and difference between the two trials was noted.

APPENDIX D

STRENGTH TRAINING PROTOCOL

The following strength training protocol is an example of the protocols used as part of the Human Performance Program. Based on the scores from the screening protocols and performance metrics, programs were modified to meet the needs of the individual soldier.

Strength Training Protocol Block A – Day 1

PROGRAM:	SF LANGUAGE

DAY 1

PRE-ACTIVITY TRAININ

CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll	In Place InStep Lunge
II. AIS Hamstring Stretch w/ Band x 10	Knee Hug
III. Leg Lowers w/ Band x 8	Split Squat w/ Reach
IV. Toe Touch w/ Squeeze (toes up) x 10	In Place Lateral Squat
	InchWorm w/ Push-up
	Assisted SL Hip Hinge
	Y-T-W-L
	Shuffle & Skip

PRIMARY TRAINING BLOC

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
ALTITUDE LANDING				
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
		63% x 2	65% x 2	
	60% x 2	68% x 2	70% x 2	
	65% x 2	73% x 2	75% x 2	58% x 2
	70% x 2	78% x 4	80% x 2	63% x 2
	75% x 4	78% x 4	80% x 4	68% x 2
	75% x 4	78% x 4	80% x 4	73% x 2

SECONDARY & TERTIARY TRAINNING BLOCKS

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
FRONT SQUAT				
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
		63% x 4	65% x 3	
	60% x 4	68% x 4	70% x 3	
	65% x 4	73% x 4	75% x 3	58% x 4
	70% x 4	78% x 7	80% x 6	63% x 4
	75% x 7	78% x 7	80% x 6	68% x 4
	75% x 7	78% x 7	80% x 6	73% x 4
SELF SUPPORTED ROW				
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
		63% x 4	65% x 3	
	60% x 4	68% x 4	70% x 3	
	65% x 4	73% x 4	75% x 3	58% x 4
	70% x 4	78% x 7	80% x 6	63% x 4
	75% x 7	78% x 7	80% x 6	68% x 4
	75% x 7	78% x 7	80% x 6	73% x 4

CORE TRAINING BLOCK

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
SEATED KNEES TO CHEST				
	50% x 15	53% x 15	55% x 15	48% x 15
	53% x 15	55% x 15	58% x 15	50% x 15
	55% x 15	58% x 15	60% x 15	53% x 15
3-POSITION TOE TOUCH				
	70% x 6	73% x 6	75% x 6	68% x 6
	73% x 6	75% x 6	78% x 6	70% x 6
	75% x 6	78% x 6	80% x 6	73% x 6

AUXILIARY TRAIINNG BLOCK - CIRCUIT

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
BARBELL GLUTE BRIDGE				
	58% x 15	60% x 15	63% x 15	55% x 15
	60% x 12	63% x 12	65% x 12	58% x 12
	63% x 10	65% x 10	68% x 10	60% x 10
PUSH-UPS				
	58% x 15	60% x 15	63% x 15	55% x 15
	60% x 12	63% x 12	65% x 12	58% x 12
	63% x 10	65% x 10	68% x 10	60% x 10
SPLIT SQUAT				
	58% x 15	60% x 15	63% x 15	55% x 15
	60% x 12	63% x 12	65% x 12	58% x 12
	63% x 10	65% x 10	68% x 10	60% x 10

Strength Training Protocol Block A – Day 2

DAY 2

PRE-ACTIVITY TRAINING

CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll	In Place InStep Lunge
	Knee Hug
II. AIS Hamstring Stretch w/ Band x 10	Split Squat w/ Reach
	In Place Lateral Squat
III. Leg Lowers w/ Band x 8	InchWorm w/ Push-up
	Assisted SL Hip Hinge
IV. Toe Touch w/ Squeeze (toes up) x 10	Y-T-W-L
	Shuffle & Skip

PRIMARY TRAINING BLOCK

VERTICAL JUMP

WEEK 1	WEEK 2	WEEK 3	WEEK 4
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	63% x 2	65% x 2	
60% x 2	68% x 2	70% x 2	
65% x 2	73% x 2	75% x 2	58% x 2
70% x 2	78% x 4	80% x 2	63% x 2
75% x 4	78% x 4	80% x 4	68% x 2
75% x 4	78% x 4	80% x 4	73% x 2

SECONDARY & TERTIARY TRAINNING BLOCKS

TRAP BAR DEADLIFT

WEEK 1	WEEK 2	WEEK 3	WEEK 4
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	63% x 4	65% x 3	
60% x 4	68% x 4	70% x 3	
65% x 4	73% x 4	75% x 3	58% x 4
70% x 4	78% x 7	80% x 6	63% x 4
75% x 7	78% x 7	80% x 6	68% x 4
75% x 7	78% x 7	80% x 6	73% x 4

PULL-UPS

WEEK 1	WEEK 2	WEEK 3	WEEK 4
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	70% x 2	73% x 2	
68% x 3	75% x 2	78% x 2	
73% x 3	80% x 2	83% x 2	65% x 3
78% x 3	85% x 4	88% x 4	70% x 3
83% x 5	85% x 4	88% x 4	75% x 3
83% x 5	85% x 4	88% x 4	80% x 3

CORE TRAINING BLOCK

LEG ABC'S

WEEK 1	WEEK 2	WEEK 3	WEEK 4
68% x 6	70% x 6	73% x 6	65% x 6
70% x 6	73% x 6	75% x 6	68% x 6
73% x 6	75% x 6	78% x 6	70% x 6

FRONT PLANK

WEEK 1	WEEK 2	WEEK 3	WEEK 4
30 sec	45 sec	60 sec	40 sec
30 sec	45 sec	60 sec	40 sec
30 sec	45 sec	60 sec	40 sec

AUXILIARY TRAINING BLOCK - CIRCUIT

STRAIGHT LEG BRIDGE

WEEK 1	WEEK 2	WEEK 3	WEEK 4
58% x 15	60% x 15	63% x 15	55% x 15
60% x 12	63% x 12	65% x 12	58% x 12
63% x 10	65% x 10	68% x 10	60% x 10

BENCH PRESS

WEEK 1	WEEK 2	WEEK 3	WEEK 4
58% x 15	60% x 15	63% x 15	55% x 15
60% x 12	63% x 12	65% x 12	58% x 12
63% x 10	65% x 10	68% x 10	60% x 10

LATERAL SQUAT

WEEK 1	WEEK 2	WEEK 3	WEEK 4
58% x 15	60% x 15	63% x 15	55% x 15
60% x 12	63% x 12	65% x 12	58% x 12
63% x 10	65% x 10	68% x 10	60% x 10

Strength Training Protocol Block A – Day 3

PHASE:	BLOCK A		
DAY 3			

PRE-ACTIVITY TRAININ	CORRECTIVE EXERCISE	MOVEMENT PREPARATION
	I. Foam Roll II. AIS Hamstring Stretch w/ Band x 10 III. Leg Lowers w/ Band x 8 IV. Toe Touch w/ Squeeze (toes up) x 10	In Place InStep Lunge Knee Hug Split Squat w/ Reach In Place Lateral Squat InchWorm w/ Push-up Assisted SL Hip Hinge Y-T-W-L Shuffle & Skip

	WEEK 1	WEEK 2	WEEK 3	WEEK 4
PRIMARY TRAINING BLOC	**BROAD JUMP**			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
		63% x 2	65% x 2	
	60% x 2	68% x 2	70% x 2	
	65% x 2	73% x 2	75% x 2	58% x 2
	70% x 2	78% x 4	80% x 2	63% x 2
	75% x 4	78% x 4	80% x 4	68% x 2
	75% x 4	78% x 4	80% x 4	73% x 2
SECONDARY & TERTIARY TRAINNING BLOCKS	**GOBLET SQUAT**			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
		63% x 4	65% x 3	
	60% x 4	68% x 4	70% x 3	
	65% x 4	73% x 4	75% x 3	58% x 4
	70% x 4	78% x 7	80% x 6	63% x 4
	75% x 7	78% x 7	80% x 6	68% x 4
	75% x 7	78% x 7	80% x 6	73% x 4
	DUMBBELL SHOULDER PRESS			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
		63% x 4	65% x 3	
	60% x 4	68% x 4	70% x 3	
	65% x 4	73% x 4	75% x 3	58% x 4
	70% x 4	78% x 7	80% x 6	63% x 4
	75% x 7	78% x 7	80% x 6	68% x 4
	75% x 7	78% x 7	80% x 6	73% x 4
CORE TRAINING BLOCK	**TRX BODY SAW**			
	63% x 8	65% x 8	68% x 8	60% x 8
	65% x 8	68% x 8	70% x 8	63% x 8
	68% x 8	70% x 8	73% x 8	65% x 8
	LANDMINE ROTATION			
	63% x 8	65% x 8	68% x 8	60% x 8
	65% x 8	68% x 8	70% x 8	63% x 8
	68% x 8	70% x 8	73% x 8	65% x 8
AUXILIARY TRAIINNG BLOCK - CIRCUIT	**TRX LEG CURL**			
	58% x 15	60% x 15	63% x 15	55% x 15
	60% x 12	63% x 12	65% x 12	58% x 12
	63% x 10	65% x 10	68% x 10	60% x 10
	INVERTED ROW			
	58% x 15	60% x 15	63% x 15	55% x 15
	60% x 12	63% x 12	65% x 12	58% x 12
	63% x 10	65% x 10	68% x 10	60% x 10
	STEP-UPS			
	58% x 15	60% x 15	63% x 15	55% x 15
	60% x 12	63% x 12	65% x 12	58% x 12
	63% x 10	65% x 10	68% x 10	60% x 10

Strength Training Protocol Block B – Day 1

PROGRAM:	SF LANGUAGE
DAY 1	
CORRECTIVE EXERCISE	**MOVEMENT PREPARATION**
I. Foam Roll II. AIS Hamstring Stretch w/ Band x 10 III. Leg Lowers w/ Activation - x 8 IV. Toe Touch w/ Squeeze (Heels Up) x 10	Walking In-Step Lunge w/ Rot. Knee Hug w/ Ext. Rot Walking Lunge w/ Reach Alternating Lateral Squat InchWorm w/ Push-up Stationary SL Hip Hinge Y-T-W-L Shuffle & Skip

PRE-ACTIVITY TRAININ

Block	Exercise	WEEK 5	WEEK 6	WEEK 7	WEEK 8
PRIMARY TRAINING BLOC	**KNEELING JUMPS**	Warm-up w/ 1-4 sets 65% x 2 70% x 2 75% x 2 80% x 4 80% x 4	Warm-up w/ 1-4 sets 68% x 1 73% x 1 78% x 1 83% x 3 83% x 3 83% x 3	Warm-up w/ 1-4 sets 70% x 1 75% x 1 80% x 1 85% x 2 85% x 2 85% x 2	Warm-up w/ 1-4 sets 63% x 2 68% x 2 73% x 2 78% x 2
SECONDARY & TERTIARY TRAINNING BLOCKS	**FRONT SQUAT**	Warm-up w/ 1-4 sets 65% x 3 70% x 3 75% x 3 80% x 6 80% x 6	Warm-up w/ 1-4 sets 68% x 3 73% x 3 78% x 3 83% x 5 83% x 5 83% x 5	Warm-up w/ 1-4 sets 70% x 2 75% x 2 80% x 2 85% x 4 85% x 4 85% x 4	Warm-up w/ 1-4 sets 63% x 3 68% x 3 73% x 3 78% x 3
	BARBELL ROW	Warm-up w/ 1-4 sets 65% x 3 70% x 3 75% x 3 80% x 6 80% x 6	Warm-up w/ 1-4 sets 68% x 3 73% x 3 78% x 3 83% x 5 83% x 5 83% x 5	Warm-up w/ 1-4 sets 70% x 2 75% x 2 80% x 2 85% x 4 85% x 4 85% x 4	Warm-up w/ 1-4 sets 63% x 3 68% x 3 73% x 3 78% x 3
CORE TRAINING BLOCK	**SEATED KNEES TO CHEST**	53% x 12 55% x 12 58% x 12	55% x 12 58% x 12 60% x 12	58% x 12 60% x 12 63% x 12	50% x 12 53% x 12 55% x 12
	PLANK WALK -UP	73% x 5 75% x 5 78% x 5	75% x 5 78% x 5 80% x 5	78% x 5 80% x 5 83% x 5	70% x 5 73% x 5 75% x 5
AUXILIARY TRAINNG BLOCK - CIRCUIT	**NORDIC LEG CURL**	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	65% x 15 68% x 12 70% x 10	58% x 15 60% x 12 63% x 10
	BENCH PRESS	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	65% x 15 68% x 12 70% x 10	58% x 15 60% x 12 63% x 10
	TRX Y TO T ROW	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	65% x 15 68% x 12 70% x 10	58% x 15 60% x 12 63% x 10

Strength Training Protocol Block A – Day 2

DAY 2

PRE-ACTIVITY TRAINING

CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll	Walking In-Step Lunge w/ Rot.
	Knee Hug w/ Ext. Rot
II. AIS Hamstring Stretch w/ Band x 10	Walking Lunge w/ Reach
	Alternating Lateral Squat
III. Leg Lowers w/ Activation - x 8	InchWorm w/ Push-up
	Stationary SL Hip Hinge
IV. Toe Touch w/ Squeeze (Heels Up) x 10	Y-T-W-L
	Shuffle & Skip

PRIMARY TRAINING BLOCK

VERTICAL JUMP

WEEK 5	WEEK 6	WEEK 7	WEEK 8
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	68% x 1	70% x 1	
65% x 2	73% x 1	75% x 1	
70% x 2	78% x 1	80% x 1	63% x 2
75% x 2	83% x 3	85% x 2	68% x 2
80% x 4	83% x 3	85% x 2	73% x 2
80% x 4	83% x 3	85% x 2	78% x 2

SECONDARY & TERTIARY TRAINNING BLOCKS

BLOCK DEADLIFT

WEEK 5	WEEK 6	WEEK 7	WEEK 8
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	68% x 3	70% x 2	
65% x 3	73% x 3	75% x 2	
70% x 3	78% x 3	80% x 2	63% x 3
75% x 3	83% x 5	85% x 4	68% x 3
80% x 6	83% x 5	85% x 4	73% x 3
80% x 6	83% x 5	85% x 4	78% x 3

PULL-UPS

WEEK 5	WEEK 6	WEEK 7	WEEK 8
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	68% x 3	70% x 2	
65% x 3	73% x 3	75% x 2	
70% x 3	78% x 3	80% x 2	63% x 3
75% x 3	83% x 5	85% x 4	68% x 3
80% x 6	83% x 5	85% x 4	73% x 3
80% x 6	83% x 5	85% x 4	78% x 3

CORE TRAINING BLOCK

CHINNIES

WEEK 5	WEEK 6	WEEK 7	WEEK 8
68% x 6	70% x 6	73% x 6	65% x 6
70% x 6	73% x 6	75% x 6	68% x 6
73% x 6	75% x 6	78% x 6	70% x 6

SIDE PLANK

WEEK 5	WEEK 6	WEEK 7	WEEK 8
30 sec	45 sec	60 sec	40 sec
30 sec	45 sec	60 sec	40 sec
30 sec	45 sec	60 sec	40 sec

AUXILIARY TRAIING BLOCK - CIRCUIT

MEDBALL REVERSE HYPERS

WEEK 5	WEEK 6	WEEK 7	WEEK 8
60% x 15	63% x 15	65% x 15	58% x 15
63% x 12	65% x 12	68% x 12	60% x 12
65% x 10	68% x 10	70% x 10	63% x 10

BENCH PRESS

WEEK 5	WEEK 6	WEEK 7	WEEK 8
60% x 15	63% x 15	65% x 15	58% x 15
63% x 12	65% x 12	68% x 12	60% x 12
65% x 10	68% x 10	70% x 10	63% x 10

LATERAL SQUAT

WEEK 5	WEEK 6	WEEK 7	WEEK 8
60% x 15	63% x 15	65% x 15	58% x 15
63% x 12	65% x 12	68% x 12	60% x 12
65% x 10	68% x 10	70% x 10	63% x 10

Strength Training Protocol Block A – Day 3

PHASE:	BLOCK B
DAY 3	
CORRECTIVE EXERCISE	**MOVEMENT PREPARATION**
I. Foam Roll II. AIS Hamstring Stretch w/ Band x 10 III. Leg Lowers w/ Activation - x 8 IV. Toe Touch w/ Squeeze (Heels Up) x 10	Walking In-Step Lunge w/ Rot. Knee Hug w/ Ext. Rot Walking Lunge w/ Reach Alternating Lateral Squat InchWorm w/ Push-up Stationary SL Hip Hinge Y-T-W-L Shuffle & Skip

PRE-ACTIVITY TRAINING

Block	WEEK 5	WEEK 6	WEEK 7	WEEK 8
PRIMARY TRAINING BLOCK	**KNEELING JUMPS**			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	65% x 2 70% x 2 75% x 2 80% x 4 80% x 4	68% x 1 73% x 1 78% x 1 83% x 3 83% x 3 83% x 3	70% x 1 75% x 1 80% x 1 85% x 2 85% x 2 85% x 2	63% x 2 68% x 2 73% x 2 78% x 2
SECONDARY & TERTIARY TRAINNING BLOCKS	**SINGLE ARM KETTLEBELL FRONT SQUAT**			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	65% x 3 70% x 3 75% x 3 80% x 6 80% x 6	68% x 3 73% x 3 78% x 3 83% x 5 83% x 5 83% x 5	70% x 2 75% x 2 80% x 2 85% x 4 85% x 4 85% x 4	63% x 3 68% x 3 73% x 3 78% x 3
	BENT-OVER KETTLEBELL ROW			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	60% x 4 65% x 4 70% x 4 75% x 7 75% x 7	63% x 4 68% x 4 73% x 4 78% x 7 78% x 7 78% x 7	65% x 3 70% x 3 75% x 3 80% x 6 80% x 6 80% x 6	58% x 4 63% x 4 68% x 4 73% x 4
CORE TRAINING BLOCK	**TRX ATOMIC PLANK**			
	63% x 8 65% x 8 68% x 8	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	60% x 8 63% x 8 65% x 8
	MEDBALL RAINBOW SLAM			
	63% x 8 65% x 8 68% x 8	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	60% x 8 63% x 8 65% x 8
AUXILIARY TRAINNG BLOCK - CIRCUIT	**1-LEG KETTLEBELL RDL**			
	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	65% x 15 68% x 12 70% x 10	58% x 15 60% x 12 63% x 10
	PUSH-UPS			
	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	65% x 15 68% x 12 70% x 10	58% x 15 60% x 12 63% x 10
	REAR FOOT ELEVATED SPLIT SQUAT			
	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	65% x 15 68% x 12 70% x 10	58% x 15 60% x 12 63% x 10

Strength Training Protocol Block C – Day 1

PROGRAM:	SF LANGUAGE

DAY 1

PRE-ACTIVITY TRAININ

CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll II. Rib Roll x 5 Breaths III. Triple Flex Reach-Roll-Lift x 10 IV. Supine 90/90 Shoulder Pack x 10	In Place InStep Lunge Knee Hug Split Squat w/ Reach In Place Lateral Squat InchWorm w/ Push-up Floor Scap Slides Y-T-W-L Shuffle & Skip

PRIMARY TRAINING BLOC

CLEAN PULL

WEEK 9	WEEK 10	WEEK 11	WEEK 12
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
			80% x 3
65% x 6		60% x 6	80% x 3
65% x 6	73% x 6	60% x 6	80% x 3
65% x 6	73% x 6	60% x 6	80% x 3
65% x 6	73% x 6	60% x 6	80% x 3

SECONDARY & TERTIARY TRAINNING BLOCKS

BACK SQUAT

WEEK 9	WEEK 10	WEEK 11	WEEK 12
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
65% x 5	68% x 5	70% x 5	
70% x 4	73% x 4	75% x 4	
75% x 3	78% x 3	80% x 3	63% x 6
80% x 2	83% x 2	85% x 2	75% x 4
85% AMRAP	88% AMRAP	90% AMRAP	83% x 2

BENT-OVER KETTLEBELL ROW

WEEK 9	WEEK 10	WEEK 11	WEEK 12
Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
68% x 5	70% x 5	73% x 5	
73% x 4	75% x 4	78% x 4	
78% x 3	80% x 3	83% x 3	65% x 6
83% x 2	85% x 2	88% x 2	78% x 4
88% AMRAP	90% AMRAP	93% AMRAP	85% x 2

CORE TRAINING BLOCK

BANDED 2-WAY HIP

WEEK 9	WEEK 10	WEEK 11	WEEK 12
55% x 12	58% x 12	60% x 12	53% x 12
58% x 12	60% x 12	63% x 12	55% x 12
60% x 12	63% x 12	65% x 12	58% x 12

TALL KNEELING PALLOF PRESS

WEEK 9	WEEK 10	WEEK 11	WEEK 12
73% x 5	75% x 5	78% x 5	70% x 5
75% x 5	78% x 5	80% x 5	73% x 5
78% x 5	80% x 5	83% x 5	75% x 5

AUXILIARY TRAINNG BLOCK - CIRCUIT

SHOULDER ELEVATED HIP BRIGDE

WEEK 9	WEEK 10	WEEK 11	WEEK 12
65% x 8	68% x 8	70% x 8	63% x 8
68% x 8	70% x 8	73% x 8	65% x 8
70% x 8	73% x 8	75% x 8	68% x 8

BENCH PRESS

WEEK 9	WEEK 10	WEEK 11	WEEK 12
65% x 8	68% x 8	70% x 8	63% x 8
68% x 8	70% x 8	73% x 8	65% x 8
70% x 8	73% x 8	75% x 8	68% x 8

KETTLEBELL LUNGE

WEEK 9	WEEK 10	WEEK 11	WEEK 12
65% x 8	68% x 8	70% x 8	63% x 8
68% x 8	70% x 8	73% x 8	65% x 8
70% x 8	73% x 8	75% x 8	68% x 8

Strength Training Protocol Block C – Day 2

DAY 2

PRE-ACTIVITY TRAININ	CORRECTIVE EXERCISE	MOVEMENT PREPARATION
	I. Foam Roll II. Rib Roll x 5 Breaths III. Triple Flex Reach-Roll-Lift x 10 IV. Supine 90/90 Shoulder Pack x 10	In Place InStep Lunge Knee Hug Split Squat w/ Reach In Place Lateral Squat InchWorm w/ Push-up Floor Scap Slides Y-T-W-L Shuffle & Skip

Block	WEEK 9	WEEK 10	WEEK 11	WEEK 12
PRIMARY TRAINING BLOC	**BOX JUMPS**			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	65% x 6 65% x 6 65% x 6 65% x 6	73% x 6 73% x 6 73% x 6	60% x 6 60% x 6 60% x 6 60% x 6	80% x 3 80% x 3 80% x 3 80% x 3 80% x 3
SECONDARY & TERTIARY TRAINNING BLOCKS	**TRAP BAR DEADLIFT**			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	60% x 5 65% x 4 70% x 3 75% x 2 80% AMRAP	63% x 5 68% x 4 73% x 3 78% x 2 83% AMRAP	65% x 5 70% x 4 75% x 3 80% x 2 85% AMRAP	58% x 6 70% x 4 78% x 2
	PULL-UPS			
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	60% x 5 65% x 4 70% x 3 75% x 2 80% AMRAP	63% x 5 68% x 4 73% x 3 78% x 2 83% AMRAP	65% x 5 70% x 4 75% x 3 80% x 2 85% AMRAP	58% x 6 70% x 4 78% x 2
CORE TRAINING BLOCK	**MEDBALL TOE TOUCH (FEET ELEVATED)**			
	68% x 6 70% x 6 73% x 6	70% x 6 73% x 6 75% x 6	73% x 6 75% x 6 78% x 6	65% x 6 68% x 6 70% x 6
	FRONT PLANK AND REACH			
	60% x 10 63% x 10 65% x 10	63% x 10 65% x 10 68% x 10	65% x 10 68% x 10 70% x 10	58% x 10 60% x 10 63% x 10
AUXILIARY TRAIINNG BLOCK - CIRCUIT	**BARBELL HIP BRIDGE**			
	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	70% x 8 73% x 8 75% x 8	63% x 8 65% x 8 68% x 8
	FLOOR PRESS			
	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	70% x 8 73% x 8 75% x 8	63% x 8 65% x 8 68% x 8
	BARBELL SHRUGS			
	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	70% x 8 73% x 8 75% x 8	63% x 8 65% x 8 68% x 8

Strength Training Protocol Block C – Day 3

PHASE:	BLOCK C

DAY 3

PRE-ACTIVITY TRAINING	CORRECTIVE EXERCISE	MOVEMENT PREPARATION
	I. Foam Roll II. Rib Roll x 5 Breaths III. Triple Flex Reach-Roll-Lift x 10 IV. Supine 90/90 Shoulder Pack x 10	In Place InStep Lunge Knee Hug Split Squat w/ Reach In Place Lateral Squat InchWorm w/ Push-up Floor Scap Slides Y-T-W-L Shuffle & Skip

Block	Exercise	WEEK 9	WEEK 10	WEEK 11	WEEK 12
PRIMARY TRAINING BLOCK	KNEELING JUMPS	Warm-up w/ 1-4 sets 65% x 6 65% x 6 65% x 6 65% x 6	Warm-up w/ 1-4 sets 73% x 6 73% x 6 73% x 6	Warm-up w/ 1-4 sets 60% x 6 60% x 6 60% x 6 60% x 6	Warm-up w/ 1-4 sets 80% x 3 80% x 3 80% x 3 80% x 3 80% x 3
SECONDARY & TERTIARY TRAINNING BLOCKS	FRONT SQUAT	Warm-up w/ 1-4 sets 55% x 5 60% x 4 65% x 3 70% x 2 75% AMRAP	Warm-up w/ 1-4 sets 58% x 5 63% x 4 68% x 3 73% x 2 78% AMRAP	Warm-up w/ 1-4 sets 60% x 5 65% x 4 70% x 3 75% x 2 80% AMRAP	Warm-up w/ 1-4 sets 53% x 6 65% x 4 73% x 2
	BARBELL ROW	Warm-up w/ 1-4 sets 55% x 5 60% x 4 65% x 3 70% x 2 75% AMRAP	Warm-up w/ 1-4 sets 58% x 5 63% x 4 68% x 3 73% x 2 78% AMRAP	Warm-up w/ 1-4 sets 60% x 5 65% x 4 70% x 3 75% x 2 80% AMRAP	Warm-up w/ 1-4 sets 53% x 6 65% x 4 73% x 2
CORE TRAINING BLOCK	TRX ATOMIC PLANK	63% x 8 65% x 8 68% x 8	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	60% x 8 63% x 8 65% x 8
	MEDBALL RAINBOW SLAM	63% x 8 65% x 8 68% x 8	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	60% x 8 63% x 8 65% x 8
AUXILIARY TRAINNG BLOCK - CIRCUIT	STABLITY BALL LEG CURL	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	70% x 8 73% x 8 75% x 8	63% x 8 65% x 8 68% x 8
	PUSH-UPS	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	70% x 8 73% x 8 75% x 8	63% x 8 65% x 8 68% x 8
	LATERAL LUNGE	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	70% x 8 73% x 8 75% x 8	63% x 8 65% x 8 68% x 8

Strength Training Protocol Block D – Day 1

PROGRAM:	SF LANGUAGE
DAY 1	
CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll II. Shoulder Sweep x 10 III. Resisted Quadraped Shoulder Flexion x 8 IV. KB Arm Bar 2 x 15 sec	Walking In-Step Lunge w/ Rot. Knee Hug w/ Ext. Rot Walking Lunge w/ Reach Alternating Lateral Squat InchWorm w/ Push-up Forward Wall Slides Y-T-W-L Shuffle & Skip

PRE-ACTIVITY TRAININ

Block	Exercise	WEEK 13	WEEK 14	WEEK 15	WEEK 16
PRIMARY TRAINING BLOC	MED BALL SLAMS	Warm-up w/ 1-4 sets 48% x 6 53% x 6 58% x 6 63% x 6 68% x 6 73% x 6	Warm-up w/ 1-4 sets 50% x 6 55% x 6 60% x 6 65% x 6 70% x 6 75% x 6	Warm-up w/ 1-4 sets 53% x 6 58% x 6 63% x 6 68% x 6 73% x 6 78% x 6	Warm-up w/ 1-4 sets 55% x 6 60% x 6 65% x 6 70% x 6
SECONDARY & TERTIARY TRAINNING BLOCKS	TRAP BAR DEADLIFT	Warm-up w/ 1-4 sets 70% x 8 68% x 8 65% x 8 63% x 8 60% x 8 58% x 8	Warm-up w/ 1-4 sets 73% x 8 70% x 8 68% x 8 65% x 8 63% x 8 60% x 8	Warm-up w/ 1-4 sets 75% x 8 73% x 8 70% x 8 68% x 8 65% x 8 63% x 8	Warm-up w/ 1-4 sets 68% x 8 65% x 8 63% x 8 60% x 8 58% x 8 55% x 8
	KETTLEBELL SINGLE ARM ROW	Warm-up w/ 1-4 sets 70% x 8 68% x 8 65% x 8 63% x 8 60% x 8 58% x 8	Warm-up w/ 1-4 sets 73% x 8 70% x 8 68% x 8 65% x 8 63% x 8 60% x 8	Warm-up w/ 1-4 sets 75% x 8 73% x 8 70% x 8 68% x 8 65% x 8 63% x 8	Warm-up w/ 1-4 sets 68% x 8 65% x 8 63% x 8 60% x 8 58% x 8 55% x 8
CORE TRAINING BLOCK	1/2 KNEELING PALLOF PRESS	55% x 12 58% x 12 60% x 12	58% x 12 60% x 12 63% x 12	60% x 12 63% x 12 65% x 12	53% x 12 55% x 12 58% x 12
	TRX HINGE	73% x 5 75% x 5 78% x 5	75% x 5 78% x 5 80% x 5	78% x 5 80% x 5 83% x 5	70% x 5 73% x 5 75% x 5
AUXILIARY TRAINING BLOCK - CIRCUIT	STABILITY BALL STRAIGHT LEG BRIDGE TO LEG CURL	68% x 10 70% x 8 73% x 6	70% x 10 73% x 8 75% x 6	73% x 10 75% x 8 78% x 6	65% x 10 68% x 8 70% x 6
	BAND RESISTED PUSH-UPS	68% x 10 70% x 8 73% x 6	70% x 10 73% x 8 75% x 6	73% x 10 75% x 8 78% x 6	65% x 10 68% x 8 70% x 6
	BAND TEARS	68% x 10 70% x 8 73% x 6	70% x 10 73% x 8 75% x 6	73% x 10 75% x 8 78% x 6	65% x 10 68% x 8 70% x 6

Strength Training Protocol Block D – Day 2

DAY 2

PRE-ACTIVITY TRAINING

CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll II. Shoulder Sweep x 10 III. Resisted Quadraped Shoulder Flexion x 8 IV. KB Arm Bar 2 x 15 sec	Walking In-Step Lunge w/ Rot. Knee Hug w/ Ext. Rot Walking Lunge w/ Reach Alternating Lateral Squat InchWorm w/ Push-up Forward Wall Slides Y-T-W-L Shuffle & Skip

PRIMARY TRAINING BLOCK

	WEEK 13	WEEK 14	WEEK 15	WEEK 16
KETTLEBELL SWINGS				
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	40% x 10	43% x 10	45% x 10	
	45% x 10	48% x 10	50% x 10	
	50% x 10	53% x 10	55% x 10	48% x 10
	55% x 10	58% x 10	60% x 10	53% x 10
	60% x 10	63% x 10	65% x 10	58% x 10
	65% x 10	68% x 10	70% x 10	63% x 10

SECONDARY & TERTIARY TRAINNING BLOCKS

	WEEK 13	WEEK 14	WEEK 15	WEEK 16
FRONT SQUAT				
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	63% x 12	65% x 12	68% x 12	60% x 12
	60% x 12	63% x 12	65% x 12	58% x 12
	58% x 12	60% x 12	63% x 12	55% x 12
	55% x 12	58% x 12	60% x 12	53% x 12
	53% x 12	55% x 12	58% x 12	50% x 12
	50% x 12	53% x 12	55% x 12	48% x 12
PULL-UPS				
	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets	Warm-up w/ 1-4 sets
	63% x 12	65% x 12	68% x 12	60% x 12
	60% x 12	63% x 12	65% x 12	58% x 12
	58% x 12	60% x 12	63% x 12	55% x 12
	55% x 12	58% x 12	60% x 12	53% x 12
	53% x 12	55% x 12	58% x 12	50% x 12
	50% x 12	53% x 12	55% x 12	48% x 12

CORE TRAINING BLOCK

	WEEK 13	WEEK 14	WEEK 15	WEEK 16
LANDMINE ROTATION				
	68% x 6	70% x 6	73% x 6	65% x 6
	70% x 6	73% x 6	75% x 6	68% x 6
	73% x 6	75% x 6	78% x 6	70% x 6
FRONT PLANK				
	30 sec	45 sec	60 sec	40 sec
	30 sec	45 sec	60 sec	40 sec
	30 sec	45 sec	60 sec	40 sec

AUXILIARY TRAINNG BLOCK - CIRCUIT

	WEEK 13	WEEK 14	WEEK 15	WEEK 16
SHOULDER ELEVATED BARBELL HIP BRIDGE				
	63% x 12	65% x 12	68% x 12	60% x 12
	65% x 10	68% x 10	70% x 10	63% x 10
	68% x 8	70% x 8	73% x 8	65% x 8
BENCH PRESS				
	63% x 12	65% x 12	68% x 12	60% x 12
	65% x 10	68% x 10	70% x 10	63% x 10
	68% x 8	70% x 8	73% x 8	65% x 8
TRX Y TO T ROW				
	68% x 10	70% x 10	73% x 10	65% x 10
	70% x 8	73% x 8	75% x 8	68% x 8
	73% x 6	75% x 6	78% x 6	70% x 6

Strength Training Protocol Block D – Day 3

PHASE:	BLOCK D
DAY 3	

PRE-ACTIVITY TRAINING

CORRECTIVE EXERCISE	MOVEMENT PREPARATION
I. Foam Roll II. Shoulder Sweep x 10 III. Resisted Quadraped Shoulder Flexion x 8 IV. KB Arm Bar 2 x 15 sec	Walking In-Step Lunge w/ Rot. Knee Hug w/ Ext. Rot Walking Lunge w/ Reach Alternating Lateral Squat InchWorm w/ Push-up Forward Wall Slides Y-T-W-L Shuffle & Skip

Block	Exercise	WEEK 13	WEEK 14	WEEK 15	WEEK 16
PRIMARY TRAINING BLOCK	BURPEES	Warm-up w/ 1-4 sets 33% x 12 38% x 12 43% x 12 48% x 12 53% x 12 58% x 12	Warm-up w/ 1-4 sets 35% x 12 40% x 12 45% x 12 50% x 12 55% x 12 60% x 12	Warm-up w/ 1-4 sets 38% x 12 43% x 12 48% x 12 53% x 12 58% x 12 63% x 12	Warm-up w/ 1-4 sets 40% x 12 45% x 12 50% x 12 55% x 12
SECONDARY & TERTIARY TRAINNING BLOCKS	GOBLET SQUAT	Warm-up w/ 1-4 sets 55% x 15 53% x 15 50% x 15 48% x 15 45% x 15 43% x 15	Warm-up w/ 1-4 sets 58% x 15 55% x 15 53% x 15 50% x 15 48% x 15 45% x 15	Warm-up w/ 1-4 sets 60% x 15 58% x 15 55% x 15 53% x 15 50% x 15 48% x 15	Warm-up w/ 1-4 sets 53% x 15 50% x 15 48% x 15 45% x 15 43% x 15 40% x 15
	INVERTED ROW	Warm-up w/ 1-4 sets 55% x 15 53% x 15 50% x 15 48% x 15 45% x 15 43% x 15	Warm-up w/ 1-4 sets 58% x 15 55% x 15 53% x 15 50% x 15 48% x 15 45% x 15	Warm-up w/ 1-4 sets 60% x 15 58% x 15 55% x 15 53% x 15 50% x 15 48% x 15	Warm-up w/ 1-4 sets 53% x 15 50% x 15 48% x 15 45% x 15 43% x 15 40% x 15
CORE TRAINING BLOCK	TRX ATOMIC PUSH-UP	63% x 8 65% x 8 68% x 8	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	60% x 8 63% x 8 65% x 8
	PLANK WALK-UP	63% x 8 65% x 8 68% x 8	65% x 8 68% x 8 70% x 8	68% x 8 70% x 8 73% x 8	60% x 8 63% x 8 65% x 8
AUXILIARY TRAIINING BLOCK - CIRCUIT	NORDIC LEG CURL	58% x 15 60% x 12 63% x 10	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	55% x 15 58% x 12 60% x 10
	DUMBBELL SHOULDER PRESS	58% x 15 60% x 12 63% x 10	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	55% x 15 58% x 12 60% x 10
	BODYWEIGHT LUNGES	58% x 15 60% x 12 63% x 10	60% x 15 63% x 12 65% x 10	63% x 15 65% x 12 68% x 10	55% x 15 58% x 12 60% x 10

APPENDIX E

CONDITIONING PROTOCOL

Conditioning Protocol Block A

Day 1	WK 1	WK 2	WK 3	WK 4
A. Run 100-120 meters @ 75% speed B. Run 20-30 meters at 85% speed C. Run 10 meters @ 100% speed D. Repeat for specified time E. Rest 6 minutes between sets F. Repeat for required number of sets	3 x 12 min	3 x 14 min	3 x 16 min	3 x 18 min
Day 2	**WK 1**	**WK 2**	**WK 3**	**WK 4**
A. Run @ moderately hard pace (75%): 3 x 200 meters, 1 x 400 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	2x	2x	1x
B. Run @ moderately hard pace (75%): 2 x 200 meters, 1 x 400 meters, 1 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	2x	1x
C. Run @ moderately hard pace (75%): 1 x 200 meters, 1 x 400 meters, 2 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	1x	2x
D. Run @ moderately hard pace (75%): 1 x 400 meters, 3 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	1x	2x
Day 3	**WK 1**	**WK 2**	**WK 3**	**WK 4**
Distance Run A. Add 15-45 seconds to your most recent mile time (best) B. Maintain that pace for the duration of the run *Example: Best mile – 7:45 + 15-45 seconds = 8:00 – 8:30 pace*	3-5 miles	3-5 miles	3-5 miles	3-5 miles

Conditioning Protocol Block B

Day 1	WK 5	WK 6	WK 7	WK 8
A. Run @ moderately hard pace (75%): 5 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	1x	2x
B. Run @ moderately hard pace (75%): 3 x 200 meters, 1 x 400 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	1x	1x
C. Run @ moderately hard pace (75%): 2 x 200 meters, 1 x 400 meters, 1 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	2x	1x
Day 2	**WK 5**	**WK 6**	**WK 7**	**WK 8**
Distance Run A. Add 15-45 seconds to your most recent mile time (best) B. Maintain that pace for the duration of the run *Example: Best mile – 7:45 + 15-45 seconds = 8:00 – 8:30 pace*	4-6 miles	4-6 miles	4-6 miles	4-6 miles
Day 3	**WK 5**	**WK 6**	**WK 7**	**WK 8**
A. Run @ moderately hard pace (75%): 4 x 100 meters, 1 x 600 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	1x	2x
B. Run @ moderately hard pace (75%): 1 x 600 meters, 4 x 100 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	1x	1x
C. Run @ moderately hard pace (75%): 1 x 100 meters, 1 x 600 meters, 3 x 100 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	1x	1x	2x	1x
Day 4	**WK 5**	**WK 6**	**WK 7**	**WK 8**
Run 1 mile as fast as possible (keep under 8 minute/mile pace) Work:Rest = 1:1	3x	3x	4x	4x

Conditioning Protocol Block C

Day 1	WK 9	WK 10	WK 11	WK 12
Sprint 400 meters 800 meters 1200 meters *Rest: Allow for full recovery between sprints*	 2x 1x	 1x 2x 1x	 3x 1x	 1x 1x 1x
Day 2	**WK 9**	**WK 10**	**WK 11**	**WK 12**
Run @ moderately hard pace (75%): 2 x 400 meters, 2 x 800 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	3x	4x	4x	3x
Day 3	**WK 9**	**WK 10**	**WK 11**	**WK 12**
Run at sub-8 minute/mile pace 1 mile 2 miles 3 miles *Rest: 5-8 minutes b/w reps*	 3x 1x	 2x 1x	 2x	 1x
Day 4	**WK 9**	**WK 10**	**WK 11**	**WK 12**
Distance Run A. Add 15-45 seconds to your most recent mile time (best) B. Maintain that pace for the duration of the run *Example: Best mile – 7:45 + 15-45 seconds = 8:00 – 8:30 pace*	5+ miles	5+ miles	5+ miles	1-3 miles

Conditioning Protocol Block D

Day 1	WK 13	WK 14	WK 15	WK 16
Sprint				
10 meters	2 x 3	2 x 3	2 x 5	2 x 5
20 meters	2 x 3	2 x 3	2 x 5	2 x 5
200 meters			2 x 2	1 x 4
400 meters	3 x 2	2 x 3	2 x 2	1 x 3
Allow for full recovery between reps and sets				
Day 2	**WK 13**	**WK 14**	**WK 15**	**WK 16**
A. Run @ moderately hard pace (75%): 4 x 100 meters, 2 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	2x	3x	2x	4x
B. Run @ moderately hard pace (75%): 2 x 100 meters, 2 x 200 meters, 2 x 200 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	2x	3x	2x	4x
C. Run @ moderately hard pace (75%): 2 x 200 meters, 4 x 100 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	2x	2x	3x	4x
D. Run @ moderately hard pace (75%): 1 x 100 meters, 1 x 200 meters, 1 x 100 meters, 1 x 200 meters, 2 x 100 meters (Rest 45 seconds b/w reps, 3 minutes b/w sets)	2x	2x	3x	4x
Day 3	**WK 13**	**WK 14**	**WK 15**	**WK 16**
A. Run 100-120 meters @ 75% speed B. Run 50-60 meters at 85% speed C. Run 30 meters @ 100% speed D. Repeat for specified time E. Rest 8 minutes between sets F. Repeat for required number of sets	4 x 10 min	4 x 12 min	4 x 14 min	5 x 10 min

Conditioning Protocol Block E

Day 1	WK 17	WK 18	WK 19
A. Run 100-120 meters @ 75% speed B. Run 20-30 meters at 85% speed C. Run 10 meters @ 100% speed D. Repeat for specified time E. Rest 6 minutes between sets F. Repeat for required number of sets	3 x 13 min	3 x 14 min	2 x 20 min
Day 2	**WK 17**	**WK 18**	**WK 19**
E. Run @ moderately hard pace (75%): 2 x 400 meters, 2 x 800 meters (Rest 40 seconds b/w reps, 3 minutes b/w sets)	4x	4x	5x
Day 3	**WK 17**	**WK 18**	**WK 19**
Distance Run C. Add 15-45 seconds to your most recent mile time (best) D. Maintain that pace for the duration of the run *Example: Best mile – 7:45 + 15-45 seconds = 8:00 – 8:30 pace*	4 miles	4 miles	5 miles
Day 4	**WK 17**	**WK 18**	**WK 19**
Long Slow Distance Run – Unpaced	40 min	40 min	40 min

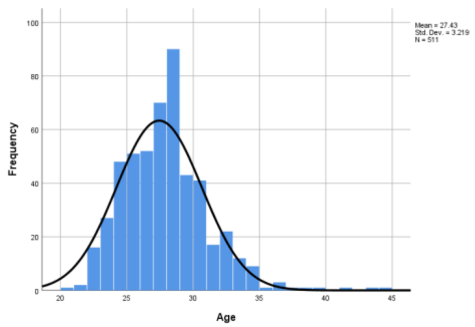
APPENDIX F

DETAILED STATISTICAL ANALYSIS

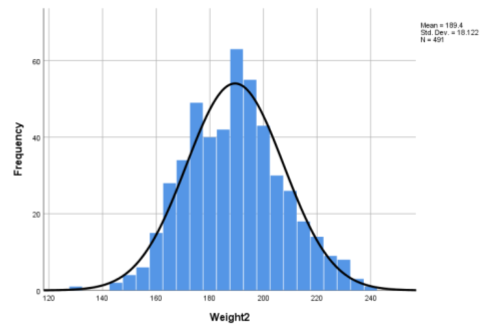
Descriptive Statistics

The descriptive statistics show an age range of participants of 20-44, (M = 27.43, SD = 3.22); N(511). The average height of the participants ranged from 62-81 inches tall (M = 70.70, SD = 2.49); N(510). The weight range for participants prior to training ranged from 135 to 240 (M = 187.73, SD = 18.27); N(510). Post-training weights ranged from 130 to 242 (M = 189.40, SD = 18.122); N(491). Time in service for the participants ranged from .8 to 21.4 years (M = 5.58, SD = 3.125); N(508).The rank of participants ranged from the lowest ranking Private First Class (PFC) to the highest ranking Captain (CPT). The Military Occupational Specialty (MOS), the job for which the soldiers were trained ranged from 18E (Special Forces Communications Sergeant) to 18A (Special Forces Team Leader).

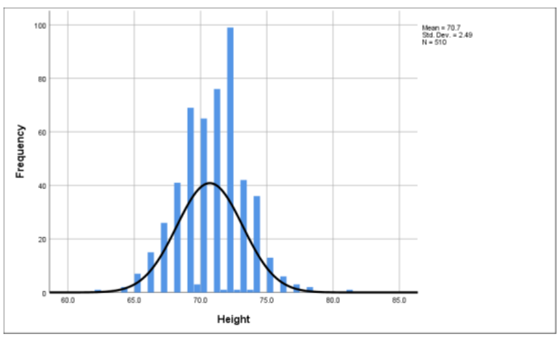
Age



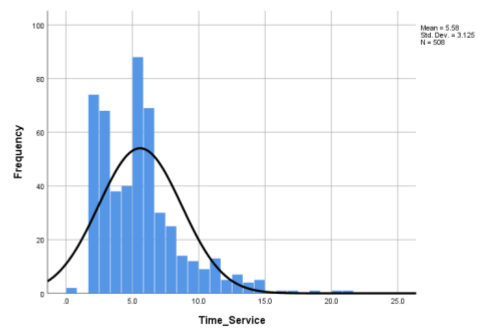
Posttest Bodyweight



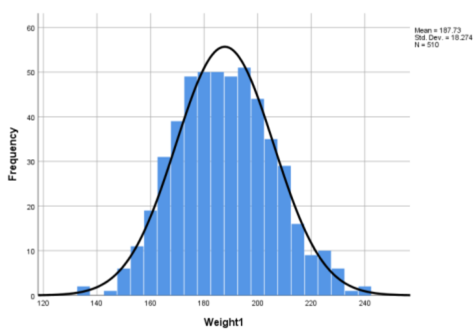
Height



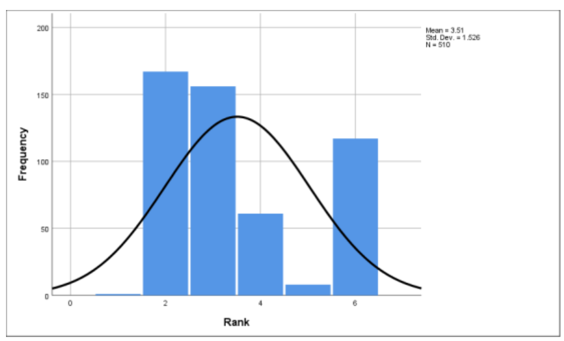
Time in Service



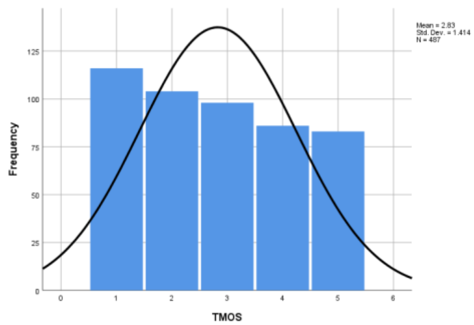
Pretest Bodyweight



Rank



Military Occupational Specialty



Paired Samples T-Test

Functional Movement Screen (FMS).

There was a significant difference in the pre Functional Movement Screen scores (M = 14.37, SD = 2.12) and post Functional Movement Screen Scores (M =15.52, SD = 1.81); $t(445) = -12.84$, $p = <0.01$, $d = 0.58$. These results suggest that the training protocols implemented influenced quality of movement. However, more studies using a control group may be needed to determine if the training protocols caused the improvement in movement quality in Special Forces Candidates.

Body fat percentage.

A significant difference also existed in the pretest Body Fat Percentage (M = 12.59, SD = 3.91) and post Body Fat Percentage (M = 11.61, SD = 3.97); $t(405) = 8.37$, $p = <0.01$, $d = 0.25$. These results suggest that the training protocols implemented influenced overall Body Fat Percentage. However, more studies using a control group may be needed to determine if the training protocols caused the improvement in body composition in Special Forces Candidates.

Standing broad jump.

In addition, there was a significant difference in the pretest Standing broad jump scores (M = 91.68, SD = 8.25) and post Standing broad jump scores (M = 93.30, SD = 8.54); $t(402) = -6.3$, $p = <0.01$, $d = 0.19$. These results suggest that the training protocol implemented likely influenced overall power. However, the effect size was small and more studies using a control group may be needed to determine if the training protocols caused the improvement in power produced by Special Forces Candidates.

5-10-5 Pro agility shuttle run.

Likewise, a significant difference occurred in the pretest 5-10-5 Pro agility shuttle run times ($M = 4.95$, $SD = 0.30$) and post 5-10-5 Pro agility shuttle run times ($M = 4.90$, $SD = .29$); $t(402) = 4.27$, $p = <0.01$, $d = 0.18$. These results suggest that the training protocols implemented influenced overall agility. However, the effect size was small and more studies using a control group may be needed to determine if the training protocols caused the improvement in agility in Special Forces Candidates.

3RM Trap bar deadlift.

Furthermore, a significant difference was also seen in the pretest 3RM Trap bar deadlift scores ($M = 323.00$, $SD = 54.16$) and post 3RM Deadlift scores ($M = 351.48$, $SD = 58.20$); $t(286) = -11.36$, $p = <0.01$, $d = 0.51$. These results suggest that the training protocols implemented influenced overall strength. However, more studies using a control group may be needed to determine if the training protocols caused the improvement in strength in Special Forces Candidates.

300-yard Shuttle run.

Though average times improved between pre and post testing, a significant difference did not occur between the pretest 300-yard Shuttle run time averages ($M = 64.66$, $SD = 2.75$) and post 300-yard shuttle time averages ($M = 64.63$, $SD = 3.48$); $t(425) = .25$, $p = .080$, $d = 0.01$. These results suggest that while the training protocols implemented influenced anaerobic endurance, improvement could likely not be contributed to the strength and conditioning protocols implemented as part of the USAJFKSWCS Human Performance Program. More studies using a control group may be needed to determine the effectiveness of the training program on anaerobic endurance in Special Forces Candidates.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	FMS1	14.37	445	2.121	.101
	FMS2	15.52	445	1.807	.086
Pair 2	BFP1	12.5865	405	3.90601	.19409
	BFP2	11.6144	405	3.96795	.19717
Pair 3	BJ1	91.6756	403	8.24819	.41087
	BJ2	93.302	403	8.5384	.4253
Pair 4	Agility1	4.9509	403	.29591	.01474
	Agility2	4.8990	403	.28892	.01439
Pair 5	DL1	323.00	287	54.157	3.197
	DL2	351.48	287	58.198	3.435
Pair 6	@300YS1	64.662	426	2.7494	.1332
	@300YS2	64.626	426	3.4782	.1685

Paired Samples Test

		Paired Differences			
					95% Confidence Interval of the Difference
		Mean	Std. Deviation	Std. Error Mean	Lower
Pair 1	FMS1 - FMS2	-1.155	1.897	.090	-1.332
Pair 2	BFP1 - BFP2	.97210	2.33794	.11617	.74372
Pair 3	BJ1 - BJ2	-1.62618	5.18189	.25813	-2.13363
Pair 4	Agility1 - Agility2	.05191	.24434	.01217	.02798
Pair 5	DL1 - DL2	-28.484	42.476	2.507	-33.419
Pair 6	@300YS1 - @300YS2	.0366	3.0360	.1471	-.2525

Paired Samples Test (continued)

		Paired Differences 95% Confidence Interval of the Difference Upper	t	df	Sig. (2-tailed)
Pair 1	FMS1 - FMS2	-.978	-12.842	444	.000
Pair 2	BFP1 - BFP2	1.20048	8.368	404	.000
Pair 3	BJ1 - BJ2	-1.11873	-6.300	402	.000
Pair 4	Agility1 - Agility2	.07584	4.265	402	.000
Pair 5	DL1 - DL2	-23.549	-11.361	286	.000
Pair 6	@300YS1 - @300YS2	.3257	.249	425	.804

Binary Logistic Regression

Pretest results and reported overuse injuries during training.

After controlling for all other factors in the model, for each one-point increase in Functional Movement Screen score, the odds of reporting an overuse injury during training was estimated to decrease slightly (by 9%), though this decrease was not statistically significant ($p = 0.33$).

The odds of reporting an overuse injury during training was estimated to decrease slightly (by 5%) for each additional percentage of body fat, after controlling for all other factors, though this estimated decrease was not shown to be statistically significant ($p = 0.44$).

After controlling for all other factors in the model, the odds of reporting an overuse injury during training was estimated to decrease slightly (by 2%) for each additional half inch measured by the Standing broad jump, yet this decrease was not statistically significant ($p = 0.49$).

It was estimated that for each additional unit of time in the 5-10-5 Pro agility shuttle run, the odds of reporting an overuse injury during training decreased by 76%, after controlling for all other factors in the model. However, these results were not statistically significant ($p = 0.11$).

The odds of reporting an overuse injury during training was estimated to increase slightly (by 1%) for every pound increase in the 3RM Trap bar deadlift, after adjusting for all other factors in the model. However, this increase was not statistically significant ($p = 0.36$).

Controlling for all other factors in the model, it was estimated that for each additional second in the 300-yard Shuttle run, the odds of reporting an overuse injury during training decreased by 2%, though this decrease was not statistically significant ($p = 0.77$).

However, there was not strong evidence that the model was useful in predicting the incidence of reporting overuse injuries during training. The omnibus, or chi square test, which determines whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories, gave only suggestive evidence ($p = 0.07$). This test also provides a “goodness of fit” which summarizes the discrepancy between observed values and the values expected under the model. In addition, the classification table showed that none of the subjects who reported an overuse injury during training, would be predicted to do so, resulting of a sensitivity of 0. All of this suggests that this model was not especially useful for predicting reported overuse injuries reported during training.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	16.998	10	.074
	Block	16.998	10	.074
	Model	16.998	10	.074

Classification Table[a]

			Predicted		
			Overuse_1		Percentage
Observed			0	1	Correct
Step 1	Overuse_1	0	280	0	100.0
		1	32	0	.0
	Overall Percentage				89.7

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	.169	.078	4.653	1	.031	1.184
	Height	.137	.123	1.239	1	.266	1.147
	Weight1	-.019	.020	.966	1	.326	.981
	Time_Service	.080	.071	1.247	1	.264	1.083
	FMS1	-.101	.104	.947	1	.330	.904
	BFP1	-.050	.065	.587	1	.443	.951
	BJ1	-.025	.036	.468	1	.494	.976
	Agility1	-1.445	.899	2.583	1	.108	.236
	DL1	.004	.005	.828	1	.363	1.004
	@300YS1	-.022	.078	.083	1	.773	.978
	Constant	-1.911	10.216	.035	1	.852	.148

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	Age	1.016	1.380
	Height	.901	1.459
	Weight1	.943	1.020
	Time_Service	.942	1.246
	FMS1	.738	1.108
	BFP1	.837	1.081
	BJ1	.910	1.047
	Agility1	.040	1.373
	DL1	.995	1.014
	@300YS1	.840	1.139
	Constant		

Pretest results and reported acute injuries during training.

For each one-point increase in Functional Movement Screen score the odds of reporting an acute injury during training was estimated to decrease (by 17%), after controlling for all other factors in the model, though this decrease was not statistically significant ($p = 0.07$).

After controlling for all other factors in the model, the odds of reporting an acute injury during training was estimated to increase slightly (by 3.5%) for each additional body fat percentage point, yet this estimated increase was not shown to be statistically significant ($p = 0.59$).

The odds of reporting an acute injury during training was estimated to remain the same for each additional inch in the Standing broad jump, after controlling for all other factors in the model, yet this was shown not to be statistically significant ($p = 0.92$).

It was estimated that for each additional unit of time in the 5-10-5 Pro agility shuttle run, the odds of reporting an acute injury during training increased by 122%, after controlling for all other factors in the model. However, these results were not statistically significant ($p = 0.39$).

It was predicted that for every pound increase in the 3RM Trap bar deadlift, the odds of reporting an acute injury during training was estimated to increase slightly (by 1%), after adjusting for all other factors in the model. However, this increase was not statistically significant ($p = 0.10$).

Controlling for all other factors in the model, it was estimated that for each additional second in the 300-yard Shuttle run, the odds of reporting an acute injury during training decreased by 4%, though this decrease was not statistically significant ($p = 0.63$).

There was not convincing evidence that the model itself was exceptionally useful in predicting the incidence of reporting overuse injuries during training. The omnibus, or chi square test, which determines whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories, was only suggestive ($p = 0.09$). Further, the classification table showed that none of the subjects who reported an acute injury during training, would be predicted to do so, resulting of a sensitivity of 0. This suggests that this model was not especially useful for predicting reported acute injuries reported during training.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	16.404	10	.089
	Block	16.404	10	.089
	Model	16.404	10	.089

Classification Table[a]

Observed			Predicted: Traumatic_1 0	Predicted: Traumatic_1 1	Predicted: Percentage Correct
Step 1	Traumatic_1	0	283	0	100.0
		1	29	0	.0
	Overall Percentage				90.7

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	-.080	.087	.840	1	.359	.923
	Height	.326	.128	6.437	1	.011	1.385
	Weight1	-.041	.021	3.815	1	.051	.960
	Time_Service	.146	.083	3.124	1	.077	1.157
	FMS1	-.191	.106	3.223	1	.073	.826
	BFP1	.034	.064	.285	1	.593	1.035
	BJ1	.004	.039	.010	1	.920	1.004
	Agility1	.797	.919	.753	1	.386	2.219
	DL1	.008	.005	2.679	1	.102	1.008
	@300YS1	-.039	.080	.235	1	.628	.962
	Constant	-18.473	10.415	3.146	1	.076	.000

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	Age	.779	1.095
	Height	1.077	1.782
	Weight1	.921	1.000
	Time_Service	.984	1.361
	FMS1	.671	1.018
	BFP1	.913	1.173
	BJ1	.931	1.083
	Agility1	.367	13.430
	DL1	.998	1.018
	@300YS1	.821	1.126
	Constant		

Pretest results and all reported injuries during training.

After controlling for all other factors in the model, each point increase in Functional Movement Screen score the odds of reporting any injury during training was estimated to decrease (by 15%), and was shown to be statistically significant (p = 0.05, 95% CI 0% to 73% decrease).

The odds of reporting any injury during training was estimated to decrease slightly (by 3.0%) for each additional unit of body fat percentage, after controlling for all other factors, yet this estimated decrease was not shown to be statistically significant (p = 0.56).

After controlling for all other factors in the model, the odds of reporting any injury during training was estimated to decrease slightly (by 1%) for each additional half inch measured by the Standing broad jump, yet this decrease was not statistically significant (p = 0.66).

It was estimated that for each additional unit of time in the 5-10-5 Pro agility shuttle run, the odds of reporting all injuries during training decreased by 19%, after controlling for all other factors in the model. However, these results were not statistically significant (p = 0.76).

The odds of reporting all injuries during training was estimated to increase slightly (by 1%) for every pound increase in the 3RM Trap bar deadlift, after adjusting for all other factors in the model. However, this increase was not statistically significant (p =0.12).

Controlling for all other factors in the model, it was estimated that for each additional second of time in the 300-yard Shuttle run, the odds of reporting all injuries during training decreased by 3%, though this decrease was not statistically significant ($p = 0.65$).

However, there was evidence that the model was potentially useful in predicting the incidence of reporting injuries during training. The omnibus, or chi square test, which determines whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories, showed to be statistically significant ($p = 0.01$). Conversely, the classification table showed that four of the subjects not predicted to report an injury did so, while those who were expected to report an injury did not, resulting of a sensitivity of 0. This indicates that this model was only somewhat useful for predicting reported all injuries reported during training.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	22.851	10	.011
	Block	22.851	10	.011
	Model	22.851	10	.011

Classification Table[a]

Observed			Predicted All_Injury_1 0	Predicted All_Injury_1 1	Percentage Correct
Step 1	All_Injury_1	0	252	4	98.4
		1	56	0	.0
	Overall Percentage				80.8

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	.068	.063	1.168	1	.280	1.070
	Height	.240	.097	6.077	1	.014	1.271
	Weight1	-.028	.016	3.150	1	.076	.973
	Time_Service	.120	.060	4.002	1	.045	1.127
	FMS1	-.159	.083	3.707	1	.054	.853
	BFP1	-.029	.050	.343	1	.558	.971
	BJ1	-.013	.029	.196	1	.658	.987
	Agility1	-.209	.692	.091	1	.763	.811
	DL1	.006	.004	2.413	1	.120	1.006
	@300YS1	-.028	.062	.206	1	.650	.972
	Constant	-11.091	7.977	1.933	1	.164	.000

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	Age	.946	1.211
	Height	1.050	1.539
	Weight1	.943	1.003
	Time_Service	1.002	1.267
	FMS1	.725	1.003
	BFP1	.881	1.071
	BJ1	.933	1.044
	Agility1	.209	3.151
	DL1	.998	1.013
	@300YS1	.861	1.098
	Constant		

Posttest results and reported overuse injuries post-training.

For each unit increase in Functional Movement Screen score the odds of reporting an overuse injury post training was estimated to decrease slightly (by 2%), after controlling for all other factors in the model, though this decrease was not statistically significant ($p = 0.89$).

The odds of reporting an overuse injury post training was estimated to increase slightly (by 2%) for each additional unit of body fat percentage, after controlling for all other factors, though this estimated increase was not shown to be statistically significant ($p =0.89$).

The odds of reporting an overuse injury post training was estimated to remain the same for each additional unit measured by the Standing broad jump, after controlling for all other factors in the model. However, this was not statistically significant ($p=.95$).

It was estimated that for each additional unit of time in the 5-10-5 Pro agility shuttle run, the odds of reporting an overuse injury post training decreased by 78%, after controlling for all other factors in the model. However, these results were not statistically significant ($p = 0.40$).

The odds of reporting an overuse injury post training was estimated to increase slightly (by 1%) for every pound increase in the 3RM Trap bar deadlift, after adjusting for all other factors in the model. However, this increase was not statistically significant ($p = 0.33$).

Controlling for all other factors in the model, it was estimated that for each additional unit of time in the 300-yard Shuttle run, the odds of reporting an overuse injury post training decreased by 12%, though this decrease was not statistically significant (p = 0.24).

There was no evidence that the model useful in predicting the incidence of reporting overuse injuries post-training. The omnibus, or chi square test, which determines whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories, was not statistically significant (p = 0.52). In addition, the classification table showed that none of the subjects who reported an overuse injury post-training, would be predicted to do so, resulting of a sensitivity of 0. This implies that this model was not useful for predicting reported overuse injuries reported post-training.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	9.116	10	.521
	Block	9.116	10	.521
	Model	9.116	10	.521

Classification Table[a]

			Predicted		
			Overuse_2		Percentage
	Observed		0	1	Correct
Step 1	Overuse_2	0	333	0	100.0
		1	10	0	.0
	Overall Percentage				97.1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	.163	.122	1.794	1	.180	1.177
	Height	-.065	.188	.118	1	.731	.937
	Weight2	.019	.031	.377	1	.539	1.019
	Time_Service	-.032	.125	.065	1	.799	.969
	FMS2	-.026	.189	.018	1	.892	.975
	BFP2	.015	.112	.018	1	.894	1.015
	BJ2	.004	.059	.005	1	.946	1.004
	Agility2	-1.516	1.786	.721	1	.396	.220
	DL2	.006	.007	.957	1	.328	1.006
	@300YS2	-.132	.112	1.390	1	.238	.877
	Constant	6.380	17.516	.133	1	.716	589.735

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	Age	.927	1.495
	Height	.648	1.356
	Weight2	.960	1.082
	Time_Service	.759	1.237
	FMS2	.672	1.413
	BFP2	.815	1.264
	BJ2	.895	1.127
	Agility2	.007	7.274
	DL2	.994	1.020
	@300YS2	.704	1.091
	Constant		

Posttest results and reported acute injuries post-training.

The odds of reporting an acute injury post training was estimated to increase (by 11%) for each unit increase in Functional Movement Screen score, after controlling for all other factors in the model. However, this increase was not statistically significant ($p = 0.62$).

For each additional body fat percentage point, it was estimated that the odds of reporting an acute injury post training was estimated to decrease slightly (by 4%), after controlling for all other factors, yet this estimated decrease was not shown to be statistically significant ($p = 0.68$).

After controlling for all other factors in the model, the odds of reporting an acute injury post training was estimated to decrease slightly (by 2%) for each additional unit measured by the Standing broad jump, yet this decrease was not statistically significant ($p = 0.75$).

It was estimated that for each additional unit of time in the 5-10-5 Pro agility shuttle run, the odds of reporting an acute injury post training increased by 12%, after controlling for all other factors in the model. However, these results were not statistically significant ($p = 0.94$).

The odds of reporting an acute injury post training was estimated to remain the same for every pound increase in the 3RM Trap bar deadlift, after adjusting for all other factors in the model. However, this was not statistically significant ($p = 0.67$).

Controlling for all other factors in the model, it was estimated that for each additional second taken to run the 300-yard Shuttle run, the odds of reporting an acute injury post training decreased by 2%, though this decrease was not statistically significant ($p = 0.83$).

There was no evidence that the model itself was useful in predicting the incidence of reporting acute injuries post-training. The omnibus, or chi square test, which determines whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories, was not statistically significant ($p = 0.29$). In addition, the classification table showed that none of the subjects who reported an acute injury post-training, were predicted to do so, resulting of a sensitivity of 0. This suggests that this model was not useful for predicting reported acute injuries reported post-training.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	11.899	10	.292
	Block	11.899	10	.292
	Model	11.899	10	.292

Classification Table[a]

Observed			Predicted		
			Traumatic_2		Percentage Correct
			0	1	
Step 1	Traumatic_2	0	333	0	100.0
		1	10	0	.0
	Overall Percentage				97.1

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	-.142	.143	.999	1	.318	.867
	Height	-.102	.190	.290	1	.590	.903
	Weight2	.059	.030	3.771	1	.052	1.061
	Time_Service	.279	.132	4.495	1	.034	1.322
	FMS2	.102	.204	.247	1	.619	1.107
	BFP2	-.044	.106	.171	1	.679	.957
	BJ2	-.019	.058	.104	1	.747	.982
	Agility2	.111	1.499	.005	1	.941	1.117
	DL2	-.003	.007	.180	1	.671	.997
	@300YS2	-.024	.112	.047	1	.828	.976
	Constant	-2.941	16.220	.033	1	.856	.053

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	Age	.656	1.147
	Height	.623	1.310
	Weight2	.999	1.125
	Time_Service	1.021	1.711
	FMS2	.742	1.652
	BFP2	.778	1.178
	BJ2	.877	1.099
	Agility2	.059	21.064
	DL2	.983	1.011
	@300YS2	.784	1.215
	Constant		

Posttest results and all reported injuries post-training.

Each unit increase in Functional Movement Screen was projected to increase the odds of reporting any injury post-training by an estimated 3%, after controlling for all other factors in the model, though this increase was not statistically significant (p=.84).

For each increase in body fat percentage, the odds of reporting any injury post training was estimated to decrease slightly (by 2%), after controlling for all other factors, yet this estimated decrease was not shown to be statistically significant ($p = 0.77$).

After controlling for all other factors in the model, the odds of reporting any injury post training was estimated remain the same for each additional half inch measured by the Standing broad jump, yet this was not statistically significant ($p = 0.98$).

It was estimated that for each additional unit of time in the 5-10-5 Pro agility shuttle run, the odds of reporting all injuries post training decreased by 40%, after controlling for all other factors in the model. However, these results were not statistically significant ($p = 0.66$).

The odds of reporting all injuries post training was estimated to remain the same for every pound increase in the 3RM Trap bar deadlift, after adjusting for all other factors in the model. However, this result was not statistically significant ($p = 0.53$).

Controlling for all other factors in the model, it was estimated that for each additional second taken to run the 300-yard Shuttle run, the odds of reporting all injuries post training decreased by 8%, though this decrease was not statistically significant ($p = 0.31$).

Moreover, there was no evidence that the model itself was useful in predicting the incidence of reporting injuries post-training. The omnibus, or chi square test, which determines whether there is a significant difference between the expected frequencies and the observed frequencies in one or more categories, was not statistically significant ($p = 0.29$). Moreover, the classification table showed that none of the subjects who reported an injury post-training, would be predicted to do so, resulting of a sensitivity of 0. All of this suggests that this model was not useful for predicting injuries reported post-training.

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	11.922	10	.290
	Block	11.922	10	.290
	Model	11.922	10	.290

Classification Table[a]

			Predicted		
			All_Injury_2		Percentage
	Observed		0	1	Correct
Step 1	All_Injury_2	0	323	0	100.0
		1	20	0	.0
	Overall Percentage				94.2

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Age	.034	.094	.128	1	.721	1.034
	Height	-.077	.133	.331	1	.565	.926
	Weight2	.038	.021	3.203	1	.074	1.039
	Time_Service	.122	.089	1.896	1	.169	1.130
	FMS2	.029	.138	.044	1	.835	1.029
	BFP2	-.023	.076	.088	1	.767	.978
	BJ2	-.001	.042	.000	1	.983	.999
	Agility2	-.515	1.157	.199	1	.656	.597
	DL2	.003	.005	.397	1	.529	1.003
	@300YS2	-.081	.080	1.030	1	.310	.922
	Constant	.123	11.764	.000	1	.992	1.131

Variables in the Equation

		95% C.I.for EXP(B)	
		Lower	Upper
Step 1[a]	Age	.859	1.245
	Height	.714	1.202
	Weight2	.996	1.083
	Time_Service	.950	1.344
	FMS2	.785	1.350
	BFP2	.842	1.135
	BJ2	.921	1.084
	Agility2	.062	5.765
	DL2	.994	1.013
	@300YS2	.789	1.078
	Constant		

Supplemental results.

Although none of the factors focused upon during this study were found to be statistically significant, pretest results were shown to influence the odds of reporting an overuse injury during training. The reporting of overuse injuries was estimated to increase by 19% with each additional year of age, after controlling for all other factors in the model. This increase was statistically significant ($p = 0.03$, 95% CI 1.6% to 38% increase).

As with the reporting of overuse injuries, factors not considered as part of the study yielded statistically significant results. Pretest results for years of age were found to influence the odds of reporting an acute injury during training, increasing reporting by an estimated 39% with each unit increase in height, after controlling for all other factors in the model. This increase was statistically significant ($p = <0.05$, 95% CI 7.7% to 78.2% increase). Conversely, each pound of weight increase was estimated to slightly decrease the odds (by 4%) of reporting of an acute injury ($p = 0.05$, 95% CI 0% to 8% decrease).

In addition, it was found that the pretest results influenced the odds of all reported any injuries during training. It was estimated that the reporting of injuries would increase by 27.1% with each unit increase in height, after controlling for all other factors in the model. This increase was statistically significant ($p = <0.05$, 95% CI 5.0% to 53.9% increase). Also, the odds of all reported injuries were estimated to increase by 12.7% for each year increase of time in service, after controlling for all factors in the model. This result was also statistically significant ($p = 0.05$, 95% CI 0% to 26.7%).

Moreover, it was found that posttest results influenced the odds of reporting an acute injury post training by an estimated 32% with each year increase in time in service, after controlling for all other factors in the model. This increase was statistically significant ($p = <0.05$, 95% CI 2% to 71.1% increase).